Annales Mycologici

Editi in notitiam Scientiae Mycologicae Universalis

Vol. XI | No. 3 | Juni 1913

A Consideration of Structure in Relation to Genera of the Polyporaceae.

By Adeline Ames[1]).

(With Plates X—XIII.)

The Polyporaceae are quite generally acknowledged to be among the most difficult plants for identification and classification. Great diversity of opinion exists, not only in regard to generic limitations, but as to the value of various characters which have been used in classification.

As is true in the systematic arrangement of other plants, in the early work, preference was given to characters which are most easily seen but which are frequently of less value in showing the relationship of species than are structural characters which require more difficult study to determine. As a result, later authors in their attempts to form a less artificial system of classification have considered of little importance some of the characters on which genera were established. Genera have also been based on structural features which subsequent authors have not regarded as recognizable characters. This is in part due to the fact that many of the characters used represent poorly defined structures, so that it is difficult to tell what they really are.

With the purpose of determining more clearly the structure and significance of some of these characters as well as rating in a measure their value in classification, a histological study has been made of a number of species. It was also hoped that such a study, supplemented by an examination of gross characters, would furnish data which would be useful in presenting an arrangement of species which might represent more natural genera. The various structures have been considered in connection with the classification in some of the more important systematic works. A short historical survey of these works will be given in order to indicate some of the characters which have been used in defining genera and also the changes which have taken place in the concept of genera. The early systematists had a very broad idea of generic limits, and took cognizance of only a few characters. With time a further

[1]) Contribution from the Department of Botany, Cornell University no. 154.

regrouping and reclassifying of species has gone on until the modern genera have been narrowed to include only a small portion of the plants in the older genera. Since the Systema Mycologicum was adopted by the International Botanical Congress at Brussels in 1910, as the starting point for nomenclature in the Polyporaceae, it will be the earliest work considered. Fries' arrangement of species will be given somewhat in detail, as the majority of later systems of classification are based in part at least on this.

In the Systema Mycologicum (Vol. 1, 1821), the Polyporaceae are arranged by Fries in two genera, *Daedalea* and *Polyporus*. *Daedalea* is described as having a pileus of corky or leathery consistency, with its hymenium borne on round or labyrinthiform pores, or on anastomosing lamellae. The fruit bodies are stipitate, sessile or resupinate. On these differences in form the genus is separated into three tribes[1]).

Polyporus is characterized as being of a fleshy, tough or corky consistency and having somewhat round pores. It is divided into two subgenera[2]), *Favolus*, with four to six-sided pores, and *Microporus*, with small sub-round pores. *Microporus* contains the greater number of species, and includes stipitate, sessile and resupinate forms, which are the basis of its separation into tribes[3]). On differences in consistency the tribes are further divided into sections[4]).

In the Genera Hymenomycetum (1836) Fries establishes the genus *Trametes* from species of *Daedalea* with round pores. He distinguished *Trametes* from *Polyporus* by the substance of the pileus descending unchanged between the pores, and in its being concolorous with the substance of the pores, while in *Polyporus*, although the pores are adnate to the pileus, they are said to be of a different color. *Cyclomyces*[5]), *Favolus*[6]) and *Hexa-*

---

[1]) I. Stipitatae (Daedalea biennis). II. Dimidiatae, further divided into three series. a) lamellate (D. betulina). b) Porose to sinuate (D. confragosa). c) Pores uniform (D. suaveolens). III. Resupinatus.

[2]) A third subgenus Polysticta includes abnormal forms and is later abandoned.

[3]) Tribes are: I. Mesopus. Pileus centrally stipitate. II. Pleuropus. Pileus laterally stipitate. III. Merisma. Pilei imbricated, laterally stipitate and branched. IV. Pileus dimidiate, sessile or effused. V. Resupinate forms.

[4]) Carnosi, Sub-carnosi, Suberosi, Sub-suberosi, Coriacei etc.

[5]) Cyclomyces Kunze & Fries. Linnea 5: 512, 1830.

[6]) In the Syst. Myc. 1: 342, 1821, Fries used Favolus as a sub-genus of Polyporus and raised it to generic rank in the Elenchus 44; 1828. It is synonymous with Hexagona Pollini. Species of Hexagona were included under the subgenus Favolus in the Systema. The genus was founded by Pollini, Pl. Nov. 35; 1816 on *Hexagona mori*. In the Epicrisis, 498, Fries has as the first species under Favolus a synonym of *H. mori*, while the first species described under Favolus by Beauvais, Fries included under Hexagona. In this way the original genera were interchanged.

gona, genera previously described, are also included. *Cyclomyces* is distinguished by pores which very soon break into concentric lamellae. *Favolus* is described as being of fleshy, tough consistency, and with a hymenium composed of lamellae united into favoloid pores. *Hexagona* has large, regular, hexagonal pores, and is of corky consistency.

In the Epicrisis (1836), the numerous sessile species of the genus *Polyporus* are subdivided by Fries on the character of the upper surface of the pileus into three sections: *Anodermei*, with no cuticle, fleshy and annual; *Placodermei*, with a hard crust and perennial; *Inodermei*, with a thin fibrous cuticle and biennial.

In the Novae Symbolae Mycologicae (1851), Fries divides the genus *Polyporus* into three subgenera; *Eupolyporus*, includes annual, fleshy, tough species; *Fomes*, the perennial species with woody indurated pileus and layered pores; and *Poria*, the resupinate forms. One group of species formerly placed with *Polyporus* is separated from it, forming the genus *Polystictus*[1]). It is composed of stipitate or sessile plants, the pileus being leathery and with a fibrous cuticle. The substance of the hymenophore is vertically opposed to that of the pileus.

These seven genera, *Polyporus*, *Daedalea*, *Favolus*, *Hexagona*, *Trametes*, *Cyclomyces* and *Polystictus*, are all that were recognized by Fries. They are based on the form of the pores as to whether they are round, daedaloid, hexagonal or lamellate, on the relation of the substance of the pileus to that of the hymenophore, and on the consistency of the pileus. The character considered next in importance, but not of generic value, was the form of the pileus.

Gillet[2]) places value on the same characters as does Fries and recognizes all the Friesian genera except *Polystictus*. He raises to generic rank the branched stipitate species of the genus *Polyporus*, the woody perennial forms and the resupinate species. They form the genera *Merisma*, *Fomes* and *Physisporus*.

---

[1]) Fries attempts to divide the Polyporaceae into two natural series by reason of differences in the development and morphology of the pores. In the one series to which the genus Polyporus belongs, the pores are said to be praeformed from above, in the other including Polystictus, Trametes, Daedalea, Favolus and Hexagona, they are successively developed outward from the center or point of attachment, and are open from the beginning. Polystictus is characterized by the substance of the pores being vertically opposed to that of the pileus, while in Daedalea, Trametes and Hexagona, the substance of the pileus is described as descending into the pores without change. The statement that the substance of the pores is vertically opposed to that of the pileus has been here interpreted to mean that the hyphae in the pores extend in a direction vertically opposite to the direction of the hyphae in the pileus.

[2]) Champ. Fr. 1878.

Saccardo[1]) adopts the Friesian arrangement. He regards it as artificial, but thinks with the present incomplete knowledge of many species that no other treatment is possible. In addition to Fries' genera, he includes the *Fomes* and *Physisporus*[2]) *(Poria)* of Gillet.

Hennings[3]) recognizes the same genera as Saccardo and also includes in the *Polyporaceae, Lenzites* placed by the previous authors cited in the *Agaricaceae.*

Winter[4]) places *Fomes* and *Polystictus* as divisions of *Polyporus*, otherwise his genera are like those of Saccardo.

The genera mentioned up to the present are those which are generally in use. The large genera like *Polyporus* contain many species differing greatly from one another. Fries and his followers have grouped those of like form, consistency, color, surface modifications etc., into tribes, sections and various subdivisions. Many of the genera of later workers have been established on the characters of these groups.

Quélet[5]) was one of the first to separate some of these divisions as distinct genera. The Friesian divisions of *Polyporus* based on the form, surface modifications and consistency of the pileus were taken with a few minor changes and raised to generic rank, making of the single genus *Polyporus* eleven genera[6]). He accepted Fries' remaining genera without change.

Patouillard's[7]) arrangement of the *Hymenomycetes* is radically different from that of Fries. The *Polyporaceae* with some of the *Thelephoraceae* regarded as degenerate poroid forms are placed in the sub-tribe *Porés*. It is separated into two large groups "Les Polypores vrais", including plants of fleshy, membranaceous or coriaceous consistency and "Les Fomes", the suberose, fibrous or woody species. The *Polypores* group is divided into series on the presence and absence of a stipe and the consistency of the pileus. The *Fomes* group includes the *Trametes* series, characterized by the pores not being distinct from the trama, and the two series *Igniaires* and *Placodes* corresponding to the Anoderm and Placoderm divisions of Fries. Genera are separated on the form of the pores, the color of the spores and in some instances on special modifications of the pileus in the way of a spongy or hairy surface layer. The color of the context, the presence and absence of cystidia are accorded only specific rank.

---

[1]) Syll. Fung. **6**. 1888.

[2]) As Poria in Syll. Fung. **6**, 292.

[3]) Engler & Prantl's Natur. Pflanz. Fam. 1^{1**} Hymenomycetineae, 1897.

[4]) Winter, Pilze in Rabhst's Krypt. Fl. 1^{1}.

[5]) Ench. Fung. 1886.

[6]) These genera are Caloporus, Leucoporus, Pelloporus, Cerioporus, Cladomeris, Placodes, Phellinus, Inodermis, Coriolus, Leptoporus and Poria.

[7]) Tax. Hymen. 1900.

Karsten[1]) in his earlier works uses the Friesian classification of the *Polyporaceae*. Later[2]) he departs from this and divides the Friesian genera into many. His separation of genera rests primarily on differences in the color of the context. On this he divides them into two large groups, irrespective of the form of the pores. The stipitate, sessile and resupinate forms are separated and grouped according to the consistency (fleshy, tough, coriaceous, etc.). The poroid, daedaloid and lamellate forms are then recognized. Other characters which he considers of generic value are the surface covering of the pileus, the presence and absence of cystidia, the color of the spores and the depth of the pores. He worked with comparatively few species, and those confined to the temperate regions of Europe.

Murrill[3]) separates the *Polyporaceae* into four tribes, *Polyporeae*, *Fomiteae*, *Poriae* and *Daedaleae*, on the basis of some of the characters used by Fries in distinguishing genera and subgenera. The tribe, *Daedaleae*, analogous to Fries' genus *Daedalea*, includes also the genus *Lenzites*, placed by Fries in the *Agaricaceae*. The remaining three tribes correspond to the sub-genera of *Polyporus*, recognized by Fries in his Novae Symbolae Mycologicae-*Eupolyporus*, *Fomes* and *Poria*. The tribe *Polyporeae*, in addition to Fries' sub-genus *Polyporus*, includes also the genera *Favolus*, *Hexagona* and *Trametes*.

After distinguishing the tribes, Murrill has followed in a large measure the ideas of Karsten in the separation of genera. He worked with a much larger number of species than Karsten, and as a result takes cognizance of additional characters, proposes a number of new genera as well as a rearrangement of old genera. The character of the context of the pileus being homogeneous or heterogeneous with that of the pores is not considered by either Murrill or Karsten to be of any value. The first division of the tribes is made on the color of the context. Murrill carries this to a further point than Karsten. In addition to separating those of brown context from those of light colored, the bright colored are separated from the white and the yellow from the red. Thus the species in Karsten's genus *Pycnoporus* include both white *(Trametes suaveolens* Fr.) and red species *(Polyporus cinnabarinus)*. Murrill places the red species in the genus *Pycnoporus*, and the white forms in the genus *Trametes*.

The sessile forms are placed in genera separate from stipitate forms. The consistency of the pileus, if fleshy, woody, corky, etc., is considered next in importance. In the tribe *Fomiteae* the character of the surface of the pileus, anoderm, encrusted or laccate, forms the basis of the ultimate division of this group into genera.

[1]) Mycologia fennica **3**. 1876.

[2]) Medd. Soc. Faun. Fl. Fenn. **5**. 1879; Rev. Myc. **3**. 1881; Finl. Basid. 1899.

[3]) N. Am. Fl. **9**[1]. 1907—08.

A number of monotypic genera based on certain striking peculiarities of individual species, as the cup like base of *Polystictus conchifer* Schw. *(Poronidulus)* and the inverted pileus of *Polystictus dependens* Sacc. *(Coltriciella)* are established.

Other characters employed in limiting genera are surface modifications of hairs, bristles, etc., the size of the pores, the color of the spores and the duplex structure of the pileus, that is, where it is spongy above and fibrous below.

Many of these characters are not considered singly, but in combination whith other characters. For example, there are groups in which species with brown spores are separated from those with hyaline spores. In other genera, species are found with brown spores, and other species with hyaline spores. The genus *Pyropolyporus* has *P. igniarius* with hyaline spores and *P. everhartii* with brown spores. But these plants have other characters in common, which in Murrill's opinion does not warrant placing them in separate genera. The seven genera of Fries have been increased to the fifty-eight (excluding resupinate species) recognized by Murrill. As in other families, with an increase in the number of species, the idea of generic limits has changed from a large aggregation of often heterogeneous plants to a small group of very like plants.

Terminology. An examination of the more important literature of the *Polyporaceae* reveals considerable variation in the terminology applied to the various parts of the fruit body by different authors. For this reason a short summary of the terms accompanied by a description of the morphology will be given.

The fruit bodies of the *Polyporaceae* are distinguished by their fertile surface, being in the form of tubes which are united to one another so that only the inner walls of the pores bear the basidia. The basidia, as in other Hymenomycetes arise as the termination of free hyphae so as to form an exposed fruiting layer. In this way there is formed a stratum of pore-like openings lined with spore producing basidia. These pores may arise directly from hyphae growing over the surface of the host or substratum, or be borne on the under surface of a structure composed of hyphal threads and especially differentiated for the purpose of bearing the porous layer. This structure is termed the pileus. The tissue or flesh of the pileus is designated trama by Saccardo[1]) and Patouillard[2]). De Bary[3]), Fries[4]), and Winter[5]) limit the term trama to the flesh of

[1]) Syll. Fung. 5: 4. 1888.
[2]) Tax. Hymen. 152. 1900.
[3]) Comp. Morph. 301. 1887.
[4]) Hymen. Eur. 439. 1874.
[5]) Pilze in Rabhst's. Krypt. Fl[1]. 1: 524. 1883.

the pores or lamellae. De Bary[1]) designates the pileus tissue medulla. It will simplify the terminology to use trama for all the internal tissue of the fruit body, and to distinguish between the two parts of the fruit body as trama of the pileus and trama of the pores. Trama will be thus used here.

The hymenium[2]) according to Fries is the fertile portion of the fruit body. In the *Polyporaceae* he considers the stratum of pores as the hymenium[3]). Fries in some of his later works uses also the term hymenophore. It is described as that portion of the pileus bearing the hymenium[4]). In plants where the porous layer is separable, the hymenophore is the part of the pileus from which the hymenium separates. In species with a nonseparable hymenium[5]) the hymenophore descends between the pores and the line of union of the hymenium with the hymenophore is not clearly defined. Quélet[6]), Saccardo[7]), Gillet[8]) and Karsten[9]) follow the terminology of Fries. Murrill considers the hymenium to be the layer of pores and the hymenophore to be the entire fruit body.

Winter[10]), Patouillard[11]) and Hennings[12]) limit the hymenium to the layer of basidia, and cystidia when present, and the hymenophore to the part bearing the hymenium which is the trama of the porous layer and the lower portion of the pileus at the base of the pores. After a consideration of the various interpretations of terms, it seems best to adopt the terminology of the latter authors as more applicable to the Hymenomycetous structure.

Methods, etc. During the course of this study an examination has been made of specimens in the herbaria of the following institutions, the Department of Botany of Cornell University, the New York Botanical Gardens, and the Forest Pathology Laboratory of the Department of Agriculture, Washington, D. C. Field collections and observations were made of as many species as possible. A histological study was made of 130 species.

---

[1]) Comp. Morph. 58. 1887.

[2]) Syst. Myc. 1: XXVII. 1821.

[3]) Syst. Myc. 1: 1821. 385. 331 under Daedalea, 341 especially in discussion of Polyporus betulinus.

[4]) Nov. Sym. Myc. 45. 1851. The description of Boletus reads, "hinc tubuli, ab hymenophoro facile secedunt".

[5]) Gen. Hym. 11. 1836. Polyporus is thus described, "Hymenophorum inter poros descendens et cum poris in stratum pileo arcte adnatum".

[6]) Ench. Fung. 164. 1886.

[7]) Syll. Fung. 6: 4,5. 1888.

[8]) Champ. Fr. 626. 1878.

[9]) Finl. Basidsv. 286. 1889.

[10]) Pilze in Rabhst's Krypt. Fl. 1[1]: 291. 1883.

[11]) Hymen. Eur. 100. 177. 1874.

[12]) Engl. & Prantl's Natur. Pflanz. Fam. 1[1**]: 152, 155. 1897.

For this purpose material was fixed and prepared for microtome sectioning. Fresh material was used whenever available, but dried material soaked in glycerine and alcohol was fairly satisfactory, especially in the less fleshy forms. The results of these observations will now be given in connection with a discussion of the structures and characters which have been used in classification. The various characters will be taken up separately.

The form of the fruit body. The fruit bodies of the *Polyporaceae* are pileate or resupinate. The pilei may be sessile or they may be elevated by a stipe. In some species the form of the fruit body has become fixed and little variation is seen. In other species, it varies with the habitat. *Polyporus schweinitzii* is stipitate when it develops from the base of a tree or root, but it is sessile when the substratum is well above the ground. *Trametes sepium* and *Polystictus biformis* are examples of species which vary from pileate to resupinate.

In stipitate forms the character and position of the stipe also varies. The stipe may be simple or branched, and with reference to their attachment to the pileus, either central or excentric. The branched stipitate forms, of which *Polyporus sulphureus* and *Polyporus frondosus* are examples, constitute the section *Merisma* of Fries, and have been regarded as separate genera by some authors (Murrill, Karsten).

In the greater number of species the stipe is of the same structure and texture as the pileus. There are a few groups in which it is specially differentiated. In *Polyporus elegans* and some nearly related species the hyphae within the stipe form a dense homogeneous tissue. Toward the surface they grow out horizontally, enlarge and terminate in elongated, thick walled, dark colored cells, which are crowded into a palisade layer, and form a black crust over the surface (Fig. 1). In some of the specimens a number of dark conidia like bodies were found on the outer surface of the stipe. Although none were seen attached, sterigmata like projections occurred on some of the surface cells of the crust and it is probable that the conidia had fallen from them. The encrusted stipes of several species[1]), related to *P. elegans* were examined. In all of these species the structure and arrangement of these surface cells were the same. Patouillard considered the encrusted stipe of generic value[2]).

The separation of plants, otherwise alike, on differences in form does not seem warranted. Where used, it should be considered only in connection with other characters. The position of the stipe in respect to the pileus, its variation by branching and its caespitose form are characters so variable and unstable that they ought not to be given generic value.

[1]) P. elegans, P. squamosus, P. underwoodii and P. fissus were studied.

[2]) The genus Melanopus is characterized by an encrusted stipe. Tax. Hymen. 80. 1900.

Annual and perennial forms. The fruit bodies of the fleshy *Polyporaceae* live through only a limited period. When drought or cold weather intervenes, growth is interrupted, and if continued for an extended time, the tissues die. The tougher forms of woody or leathery consistency are able to withstand severe conditions and continue growth after such interruptions.

Growth of the fruit body takes place in several different ways. In thin leathery forms like *Polystictus versicolor*, it is limited to the marginal hyphae and the fruit body does not increase in thickness. The areas representing the increase in width during the different periods of growth are usually separated by furrows. Most of these species are annuals.

Another form of growth is that which takes place both from the upper surface and margin. The surface hyphae remain unmodified and in growing condition. In section these fruit bodies show within concentric zones marking the different periods of growth. The upper surface is azonate and unfurrowed as the outer layer of hyphae are developed at one period. Fruit bodies growing in this manner increase in thickness as well as in width. *Trametes suaveolens* is a good illustration.

There are also fruit bodies in which the hyphae of the upper surface are so modified that they are incapable of further growth. In these forms, growth takes place from the margin and from the hymenial surface. The hymenophore instead of the flesh of the pileus is layered and the upper surface is often furrowed corresponding to the interruption of growth. The pileus may be thin while the fruit body will be very thick, because of the many layers of tubes in the hymenophore. Fruit bodies of this kind often continue growth through many years. Each layer in the hymenophore does not represent annual growth, but it does represent periodic growth, which may have been due to drought as well as season.

Fries founded the *Fomes*[1]) section of the genus *Polyporus* in part on the character of the layered hymenophore. Later this section was raised to generic rank by Gillet[2]) and has since been used in the classification of the *Polyporaceae* by the majority of workers. The layering of the pileus has been used only in specific descriptions. Distinctions based on the growth of the fruit body other than that they are annual and perennial have been little used. Age is not considered in the classification of other plants and there seems to be no more reason why the annual or perennial character of a fruit body should be considered in the *Polyporaceae* than in any other group of plants, except in specific descriptions.

The consistency of the fruit bodies. The consistency of the fruit body has been one of the most important characters used by syste-

[1]) Nov. Sym. Myc. 47. 1851.
[2]) Champ. Fr. 682. 1878.

matists in the classification and identification of these plants. They vary from soft, fleshy forms like *Polyporus chioneus* to very dense, heavily encrusted plants like *Fomes applanatus*. In distinguishing the different types of consistency, various terms descriptive of their peculiarities have been used. Thus we have carnose, coriaceous, suberose, lignose, etc. The terms in themselves are the best description of the special characters of the tissues to which they are applied.

The tissue throughout the pileus is usually quite homogeneous. There are some species, however, in which there are layers of very dense hard tissue within the softer tissues of the pileus[1]). In other species the mature pileus is divided into two distinct regions of different hyphal arrangement[2]). Quite a number of these plants have a loose spongy tissue in the upper portion of the pileus, and a denser, fibrous layer below. This duplex character[3]) of the pileus has been used by some authors in the separation of genera (Fig. 2).

A study was made of a number of species to determine what differences exist in the character of the tissue and the arrangement of the hyphae in the fruit bodies of different consistency. There appear to be certain types of hyphal arrangement which accompany a certain consistency of the pileus. Some of these which stand out as well differentiated have been recorded.

In the growing margin of the pileus the hyphae, whatever may be their subsequent arrangement, are usually parallel to one another, little interwoven and extend in the direction of growth. As the pileus matures they become variously interwoven and modified. In the examination of material the mature fruit body only was considered.

Coriaceous forms. In the coriaceous species the pileus is quite thin and usually fibrous and flexible. The species examined presented few differences. The density of the tissue varies but little, the hyphae of some are finer than those of others, or sometimes more intricately interwoven, but the general arrangement is the same. *Polystictus versicolor* (Figs. 3, 4) is typical of this group. The hyphae extend singly or in loose strands parallel to the surface. The strands radiate somewhat, but are little interwoven and form a tissue homogeneous throughout the pileus. In *Polystictus perennis* the hyphae are scarcely interwoven and appear rather as a layer of loose fibres (Fig. 5).

Fleshy-coriaceous forms. *Polyporus elegans* might be taken as typical of this group as all the plants examined showed much the same kind of tissue. The hyphae, usually rather fine, are intricately interwoven and extend in no definite direction. They form a dense tissue,

---

[1]) Ganoderma australe.

[2]) Polystictus circinatus. Polyporus borealis etc.

[3]) Patouillard, Tax. Hymen. 84. 1900. Murrill N. A. F. 9[1]: 37. 1907.

homogeneous throughout the pileus (Figs. 6, 7, 8). *Polyporus squamosus* varies somewhat from this typical structure. It is a larger, more fleshy plant and has stouter hyphae which, however, have the same arrangement as those of the other species of this group.

Tough-fleshy forms. The plants of this series have a tissue generally uniform throughout the trama of the pileus. The hyphae are usually stout, thin walled and variously arranged in different species. In some species they extend parallel to the surface of the pileus, but are somewhat interwoven and not in loose strands as in *Polystictus perennis* and related plants. *Polyporus frondosus* is a good illustration of this type (Fig. 9). In some species the hyphae are intricately interwoven and form a tissue approaching the fleshy-coriaceous forms. *Polyporus cryptopus* has this kind of tissue (Fig. 10). In others the hyphae are quite loosely interwoven and these species approach the spongy forms both in consistency and in the arrangement of the hyphae (Fig. 11).

Spongy forms. This group has a very open tissue composed of loosely united, stout hyphae (Figs. 12, 13, 14). The tissue is often not homogeneous, but here and there in the open network will be strands of denser tissue. They probably make the pileus firmer than it would be with an entirely open tissue. The plants vary from the soft spongy forms of very loosely arranged hyphae, like *Polyporus leucospongia* (Fig. 15) to those of quite firm consistency and hyphal arrangement approaching that of fleshy or corky forms (Fig. 54).

Suberose forms. The tissue of this group is much like that of the tough-fleshy forms. The hyphae are generally coarser than in those species, but the arrangement is the same. They are more or less intricately interwoven, and form a dense homogeneous tissue. *Daedalea quercina* is a good representative of a fruit body with corky consistency (Fig. 16).

Woody forms. The plants of this group usually have a fibrous tissue. The hyphae somewhat intertwined extend parallel to the surface and are very densely compacted. The arrangement is much like that of the coriaceous forms but the tissue is denser and the hyphae usually thicker walled. *Fomes annosus* illustrates this type of pileus (Figs. 17, 18, 19, 19a).

This study shows that the consistency of the pileus is to a certain extent correlated with the arrangement of the hyphae. The character of the hyphae themselves, the thickness of their walls and the amount of water within the cells also give special qualities to the tissues.

The size of the hyphae. Measurements were made of hyphae in different portions of the fruit body. In different plants of the same species the size of the hyphae do not vary in a noticeable manner, but there is some difference in different portions of the same fruit body. The hyphae are stouter in the pileus trama, becoming smaller in the

pores. Large fruit bodies, especially those of loose context, have stout hyphae while slender hyphae are usually found in the dense tissue of small plants.

In general the size of the hyphae is of little diagnostic value since there is so small a range of variation in different species. Occasionally differences in the size of hyphae are of value in specific determinations. For example, *Polyporus perplexus* and *P. radiatus* often resemble each other very closely, but the former species has much stouter hyphae than the latter.

Surface modifications. The fruit bodies of the *Polyporaceae* show striking differences in surface modifications so that no character has been more used in classification. It was on these differences that Fries divided the genus Polyporus into three sections, — 1st, *Anodermei* — without any cuticle; 2nd, *Inodermei* — with a thin fibrous cuticle; 3rd, *Placodermei* — clothed with a hard crust. These differences have been recognized by others and have formed the basis of many of the new genera. An examination has been made of plants from all of these groups, to find what structural differences are associated with these characters.

Anodermei. The pilei in which the upper surface remains capable of further growth has a completely undifferentiated surface. The upward extending surface hyphae become a part of the pileus tissue as growth proceeds and do not differ from the trama hyphae. The outer hyphae terminating in many loose ends often give a villous appearance to the surface. *Trametes suaveolens* has a surface of this kind, which becomes smooth as the hyphae become appressed (Fig. 20). In some species they become united in loose wefts resulting in a strigose surface as in *Polyporus borealis* (Fig. 21). When growth is interrupted for a long period, or in forms where no surface growth occurs, the exposed hyphae become darker than those in the tissues below, and as they dry become somewhat appressed. There is no change, however, in the hyphae themselves or in their arrangement (See Figs. 22, 23).

The beginning of a differentiated surface is seen where the surface hyphae become slightly compacted and the pileus appears to be covered with a cuticle. *Polyporus chioneus* usually has such a surface (Fig. 24). In *Polyporus fissus* the condensed hyphae form a pseudoparenchyma making a very compact tissue which in section shows little of its mycelial origin and resembles somewhat the suberized tissues of higher plants (Fig 25). Outwardly, however, the surface of this species does not differ much from related species in which there is no such modification of the surface hyphae. Although some of these species have a slightly modified surface covering and a cuticle cannot be considered as lacking in all of them, the surface is not so plainly differentiated from the pileus as in the next section.

Placodermei. The hyphae of the upper surface of the plants in this group are more compacted and in many species the pileus is

encrusted. *Polyporus betulinus* has a cuticle which resembles that in some specimens of *Polyporus chioneus*, but it is more strongly differentiated, separable, and in age is often exfoliated from the fruit body. The surface is composed of a layer of very densely packed hyphae. Between this layer and the trama there is a stratum of loose hyphae showing lines of cleavage even in the young pileus. It is along this line that the tissue breaks when the cuticle separates from the pileus (Fig 26).

The species with an encrusted surface vary from the thin crusts of the annual species to the thick hard crusts of some of the perennial forms. In slightly encrusted species, like *Polyporus planus* (Fig. 27) strands of hyphae extending parallel to the surface become modified. Probably some change similar to gelatinization occurs in the cell walls of the hyphae near the upper surface which agglutinates them together. The hyphae in this region are much darker than the trama hyphae below and form a thick, dark crust covering the pileus. A similar crust is found in *Daedalea mollis*. Growth of some of the surface hyphae may continue after a crust has been formed, the younger hyphae forming a layer above the encrusted stratum which then appears as a dark line in the pileus (Fig. 28).

In many species some of the trama hyphae grow obliquely upwards and the ends become agglutinated into a dense crust which thickens and darkens with the aging of the plant. *Fomes ellisianus* usually has a surface of this kind (Fig. 29).

Very often in these heavily encrusted species hyphae coarser and thicker-walled than the trama hyphae and enlarged at the end, extend vertically upward into the crust. Intermingled with them are the finer, thinner walled hyphae (Fig. 30).

In *Polyporus benzoinus* these vertical hyphae are near enough to one another to form a layer of palisade-like cells. The cells have greatly thickened walls, and are irregular in form and arrangement. From this layer, hyphae grow upward in irregular tufts and become compacted at the surface into a thin resinous crust (Figs. 31, 32).

In *Ganoderma lucidum* and related species the vertical hyphae form a layer of cells much as in *Polyporus benzoinus*, but the cells are of more uniform size, thicker walled and arranged so as to form a much more even compact palisade tissue than in *Polyporus benzoinus*. There are no hyphae growing upward from the palisade layer but the cell walls at the surface are modified into a thick, laccate crust (Fig. 33).

At the extreme outer margin of the pileus the layer of palisade cells is wanting. The development of the cells was followed in the growing margin of the plant. Some of the undifferentiated pileus hyphae grow upward side by side and terminate in an even line at the surface. They gradually elongate, and the cell walls become modified resulting in the

crust of the mature plant. None of the unmodified hyphae reach the surface and the pileus is covered by this layer of palisade cells, comparable to the cutinized epidermal cells of ligher plants. Four species of *Ganoderma*[1]) examined have a covering of this kind with no discernable differences aside from the size of the cells. Although hyphae growing vertically upward were found in other species, in none did they form the perfect uniform layer present in these plants.

Inodermei. In many forms instead of the hyphae being compacted into a crust at the upper surface they end loosely, as hairs of various types. Fries described these plants as having a thin fibrous cuticle. They can hardly be considered as having a cuticle, however, as the upper surface is composed only of the unmodified terminations of the trama hyphae.

In the simplest of these hairy coverings a few of the trama hyphae end at the surface singly or in loose strands. Many of the thin, coriaceous species as *Polystictus prolificans*, *P. versicolor*; etc., have surfaces of this type (Figs. 34, 42). The great number of these hairs, in some species, almost constitute a layer distinct from the pileus. The hyphae become united into close strands so that the single surface hairs visible to the eye are composed of a number of hyphae. *Trametes peckii* illustrates this kind of surface. In *Trametes hydnoides* the surface is especially conspicuous because of the coarse black hairs composed of a number of closely united hyphae.

The surface modifications are almost the only differentiations that the tissues of the fruit body undergo. Consequently they should be considered as important characters in any arrangement of the plants on a structural basis.

The hymenophore. From a taxonomic point of view the hymenophore is an important part of the fruit body, since its poroid character separates the group from related families. In some the pores become so changed that the poroid character is hardly discernable, and all gradations are seen going toward the *Agaricaceae* on the one side and the *Hydnaceae* on the other. All the plants belonging to this group, aside from a few species of *Lenzites*, have the poroid configuration of the hymenophore at least in the early stages of growth.

The development of the pores. Fries[2]) distinguishes two methods of pore formation in the *Polyporaceae*. In one the pores are praeformed from above so that at first the mouths remain closed, and the lower surface appears as a smooth, contiguous layer. In the other they are successively evolved from the center outward and are open from the beginning. In the greater number of Polypores, the pores are

[1]) G. oregonense, G. sessile, G. curtisii, G. lucidum.

[2]) Nov. Sym. Myc. 46 1851.

formed by the latter method. In many, especially the perennial forms, it is difficult to say in what manner they develop.

When the pores are formed exogenously they may arise directly from the trama hyphae or from a layer of hyphae differentiated from the trama. *Polyporus sulphureus* is an example of the former type. A section through the growing margin shows the early stages of pore formation. On the lower side of this portion of the pileus the hyphae are more closely interwoven and smaller. The contents of the cells are more granular than in the remainder of the pileus and instead of the hyphae extending parallel to the surface, they are obliquely arranged. In section a few hyphae can be seen growing more rapidly than adjacent hyphae and extending downward at right angles to those of the surface (Figs. 35, 36, 37). On the lower surface of the pileus these rapidly growing hyphae extend over an area in the form of a net, the regions in which the hyphae do not grow, corresponding to the meshes, and forming the future pores. This downward growth of hyphae continues until the mature tubes are formed. Basidia begin to appear when the pore cavities are quite shallow. They are formed by some of the hyphae growing outward at right angles and enlarging at the end.

Polyporus fumosus is a form in which the hymenophore arises from a specially differentiated layer. On the lower surface of the growing margin of the pileus where the pores are not yet formed, the hyphae become condensed and form a layer of compact tissue about 160 μ thick. This persists as a dark layer directly above the hymenophore. In a section through the immature pileus the first indication of pore formation are these condensed hyphae, forming a dark layer on the lower surface of the pileus (Fig. 38). In portions of the pileus a little older hyphae growing downward to form the pores can be seen. They form a very narrow fringe, and in areas where the pores are to be, cease growing in a space equal to the width of the pore, lose their protoplasm and become condensed while the surrounding hyphae continue to grow and form the walls of the tubes (Fig. 39).

Fomes applanatus represents a form where the pores in part, at least, develop endogenously. Hyphae grow downward from the pileus or from the hymenophore of the previous year and form a stratum of tissue from which the pores arise. A section through the pileus will show small cavities a short distance above the lower surface. These cavities gradually elongate, and when they break through the surface an open pore is formed. The growing pores are filled with a white substance, and because of this the first stages in their formation are very plainly seen as a white blotch in the brown context. In *Ganoderma lucidum* the pores usually appear beneath a layer of downy hyphae and granules which cover the lower surface of the fruit body. The surface may be perfectly smooth with no indication of pores, but when the outer layer of hyphae

is scraped away the young pores, often of some depth, can be seen below. How general this method of hymenophore development is, cannot be said. Some thirty species were studied in growing condition. *Ganoderma lucidum* and *Ganoderma applanatum* were the only forms studied in which the pores were not produced exogenously, and in some specimens of these species they seemed to be formed in that way. Fries, however, implies that the usual order of development of the pores in the genus *Polyporus* is endogenous[1]). He uses the development of the pores as one of the characters in distiguishing *Polystictus* and *Trametes* from *Polyporus*. In the genus *Polyporus* the pores are said to be praeformed and not open from the first as in *Polystictus*. It is doubtful, however, if this character is of any value in classification. At least the development of a great many forms must be followed before data sufficient for it to be of any use can be obtained.

Fries also distinguishes between *Polyporus* and *Polysictus*[2]) in that the pores of the latter genus are evolved successively from the center or point of attachment outward. In all the species studied the pores are developed from the point of attachment outward. The pileus of some forms as *Polyporus fissus* attain nearly their full size before pore formation begins and the pores appear to be formed simultaneously and not successively (Fig. 40). Even in these species the pores at the margin are often immature when those at the center are fully developed. Judging from the forms examined, there is not sufficient difference in the order of development of the pores for it to be used as a character in classification.

The relation of the hymenophore to the pileus. The genus *Trametes* as established by Fries was distinguished from *Polyporus* by the hymenophore concolorous with the substance of the pileus and descending unchanged between the pores, while in *Polyporus*, although the hymenophore does not form a layer separable from the pileus as in *Boletus*, it is not concolorous with it. Later Fries recognizes another generic type in the genus *Polystictus*, in which the hyphae of the pores extend in a direction vertically opposed to that of the hyphae in the pileus. Later authors have also used the relation of the hymenophore to the pileus in classification, especially in defining the genus *Trametes*. Some few, Murrill and Karsten among them, have considered the character of no value and ignored it. A macroscopic examination of the fruit bodies reveals little that determines with certainty the true relationship of these parts. Plants placed by Fries in the genus *Trametes*, examined in this way, show the hymenophore homogeneous with the trama of the pileus, but the same is also true of many plants considered as belonging to the

[1]) Nov. Sym. Myc. 46—47. 1851.
[2]) Nov. Sym. Myc. 70. 1851.

genus *Polyporus*. In a few, as *Polyporus adustus*, the hymenium is well differentiated in color from the pileus, in others there are only slight differences in color and in the majority of species there is no difference. Also in a few species the context of the hymenophore seems to be of a firmer or more fragile texture than that of the pileus. In the greater number of species however, the pileus is homogeneous with the hymenophore, so far at least as one is able to find in an examination of the fruit bodies as a whole.

With the idea in mind of finding something more definite as to the relation between the tissues of the pileus and hymenophore, an examination was made of microtome sections of over 100 species. As a result of this study, several different types of arrangement of hyphae were distinguished. These, however, were connected with one another by so many gradations that it is difficult to group the various species around any one type.

The forms where the pileus is perfectly homogeneous with the hymenophore will be first considered. In *Trametes suaveolens* the pileus hyphae are much tangled and interwoven and form a homogeneous tissue. As they descend into the hymenophore they retain the same character. No change in the arrangement or density of the hyphae is discernable, and no definite direction of growth can be seen. The pores as described by some authors for the *Trametes* group appear as if they had been hollowed out of the pileus (Fig. 41). This arrangement of the hyphae was found in a number of species[1]). The tissue of the species *Daedalea* examined was uniformly homogeneous, and even in the growing margin and newly formed pores the hyphae were quite tangled and interwoven, and differences in context were scarcely discernable. The same was also true of several species of *Polyporus* and *Favolus*. Most of the plants with this relation of hymenophore and pileus were of tough, coriaceous to corky consistency. It was observed also in several tough, spongy forms as *Polyporus alboluteus* (Fig. 14). Species included by Fries in the genus *Trametes* as well as some in *Polyporus* and *Polystictus* show gradations connecting the structures characteristic of *Trametes suaveolens* with what Fries described as typical for and in part on what he established the genus *Polystictus*.

Polystictus abietinus seems to well represent this group (Figs. 42, 43). Fries stated that in *Polystictus* the substance of the pileus was vertically opposed to that of the hymenophore. In *Polystictus abietinus* the hyphae of the trama extend parallel to the surface. When the pores are formed some of the hyphae or their branches extend obliquely downward and, turning gradually, soon grow at right angles to the

[1]) *Trametes gibbosa, Daedalea quercina, Daedalea amanitoides, Daedalea ambigua, Favolus europaeus, Polyporus humilis, Favolus cucullatus.*

hyphae of the trama. Thus the hyphae of the pileus extend in a direction vertically opposed to that of the hyphae in the hymenophore. The trama of the pores is no denser than that of the pileus. The hyphae may be slightly finer as they are not as old as those above in the trama.

The greater number of species studied showed a relation between the hymenophore and pileus much as described for *Polystictus abietinus*. Not only the plants included in the genus *Polystictus* by Fries are of this type, but also species placed in *Polyporus* and *Fomes* (Figs. 44, 9). In some this relationship is less evident as the hyphae of the pileus, although extending predominately parallel to the surface, may be more or less interwoven and irregular in arrangement. *Polyporus berkleyi* illustrates this variation. The tissue of both the pileus trama and that of the pores is a loosely interwoven network, but it can be easily seen that the predominating hyphae of the hymenophore and pileus are perpendicular to each other (Fig. 45). A slightly different arrangement of the hyphae is seen in *Polystictus perennis* and related species. The hyphae of the pileus extend as in *Polystictus abietinus*, uniformly parallel to the surface, but as they descend into the hymenophore, they do not lie parallel with the pores, but become loosely interwoven into a net-like tissue with strands extending in no definite direction. In these species the trama of the pileus is of a type of tissue different so far as hyphal arrangement is concerned from the trama of the pores (Figs. 5, 46, 47).

The arrangement of hyphae in the pileus trama must determine to a large extent their arrangement in the hymenophore. At least a certain number of hyphae must extend in the direction of growth. If in the pileus the hyphae are parallel to the surface as they descend into the hymenophore, they must change their direction to that of the pores which are vertically opposed to the pileus. When the hyphae are intricately interwoven in the pileus trama they appear to radiate in all directions and any change of direction of the hyphae descending into the hymenophore is not discernable, so that the tissue of the pileus appears to be homogeneous with that of the hymenophore. In all the forms discussed so far the only difference between the substance of the pileus and that of the hymenophore is in the direction of growth of the hyphae. Another type very distinct from this is where the hymenophore tissue is composed of hyphae more compactly arranged than those in the pileus.

Polyporus sulphureus is a good example of this type. The fruit body examined macroscopically shows no marked difference in the tissue of the pileus and that of the hymenophore. The pores, because of their thin walls, look somewhat more fragile, but the tissue seems to descend into them unchanged. In microtome sections, however, it is clearly seen that the tissue in the pileus is different from that in the hymenophore. The hyphae in the pileus are from 8—9 μ wide and extend predominantly parallel to the surface. As they pass into the hymenophore they

become much condensed and finer, being from 2—3 μ wide. They descend parallel with the pores and form a stratum of tissue clearly differentiated from that of the pileus (Fig. 48).

This condensation of hyphae in the pores was observed in a number of species. *Polyporus ovinus*, *P. chioneus*, *P. elegans*, *P. dealbatus*, *P. unicolor* (Figs. 49, 50, 51, 52, 53, 54) were among these species. In the majority of these plants the loose spongy tissue in the pileus and the denser tissue in the hymenophore is probably correlated with the formation of the hymenium. A sub-hymenial layer, distinct from the trama of the pores as is found in the *Agaricaceae* is not so clearly differentiated in the *Polyporaceae* (Figs. 55, 56, 57). In the former family the trama hyphae by several repeated branchings usually form a layer of short hyphae which terminate in basidia. If the trama hyphae produce basidia without the formation of a sub-hymenial layer, a limited number only could be formed. In the fleshy fungi which at best are short lived, it is especially important that a large number of basidia be produced. The condensation of the hyphae in the hymenophore accomplishes the same purpose as the formation of a sub-hymenial layer. It increases the number of hyphae that are to terminate in basidia. This is clearly seen when it is noted that the forms in which this modification occurs are annuals, many of them living a short time. It is also best developed in species with a very loose tissue where there would be fewer hyphae to descend into the hymenophore. In these species the compacted hyphae in the trama of the pores, without branching or with very little branching, terminate in basidia. In forms with a loose tissue, where there is no increase of hyphae in the hymenophore, there is usually a conspicuous sub-hymenial layer. *Polyporus alboluteus* is a good example of this type (Fig. 58). The hyphae form a loose tissue in the hymenophore like that in the pileus, but by several repeated branchings, produce a thick sub-hymenial layer with many hyphae terminating in basidia.

Polyporus adustus and *Polyporus fumosus* have the hymenophore arising from a specially differentiated layer[1]). In *Polyporus adustus* this layer of very dense tissue is from 200 to 225 μ thick (Figs. 59, 59a). It is not so thick in *Polyporus fumosus* (Fig. 60). As the hyphae descend from this layer into the hymenophore they become more loosely arranged but are more condensed than those in the pileus. The structure of these plants is distinct from that of the other species studied[2]). Several other species have been classed with them because of the dark colored pores. Unfortunately, no material of these species was available for study, so it cannot be stated if this modification of the fruit body is of wider occurrence.

---

[1]) See p. 31.

[2]) *Polyporus puberula* was examined. It was indistinguishable from *Polyporus fumosus*.

Polyporus betulinus was studied because its hymenophore is separable from the pileus. Sections through the fruit body show the hyphae intricately interwoven in the pileus and becoming slightly condensed as they descend into the hymenophore where they pass downward somewhat parallel to the pores (Fig. 8). In sections from some fruit bodies a line of looser tissue could be seen immediately above the hymenophore (Fig. 61). In cutting the material there was a tendency for the tissue to break here and it is evidently the line of cleavage along which the hymenophore later separates from the pileus. Although the hymenophore was easily separated in some of the young fruit bodies, in most of them, even in the mature pilei, the tissue was perfectly homogeneous, the lines of cleavage appearing at a later period.

Gloeoporus conchoides was also examined as a form with a separable hymenophore. Here as in *Polyporus adustus* the hymenophore arises from a layer of denser tissue, but instead of the hyphae passing immediately down into the hymenophore, a narrow layer of very loose tissue is formed, and from this the hyphal strands extend downward to form the walls of the pores (Fig. 62). In the pore walls the spaces between the hyphae are filled with a gelatinous matrix (Fig. 63). The hyphae in themselves would form only a loose tissue as is seen in the subhymenial layer where the gelatinous substance is wanting. The hymenophore separates from the pileus along the layer of loose tissue, and often the hymenium falls away from the trama of the pores along the line of subhymenial tissue in which the gelatinous substance is lacking.

It is evident from these observations that the generic distinctions made by Fries and some of his followers on the relation of the hymenophore and pileus cannot hold, at least in their entirety. The genera *Daedalea*, *Favolus* and *Trametes*, as understood by Fries, have the trama of the hymenophore homogeneous with that of the pileus. Although this is true of many species included in these genera, it is equally true of species which have been placed in the genus *Polyporus* and which in other characters are very different from these plants[1]). Also the plants in which the hyphae in the hymenophore are vertically opposed to those in the pileus are not confined to Fries' genus *Polystictus*, but such a relation of the hymenophore and pileus is commonly found in other genera[2]).

The principal differences between the substance of the pileus and hymenophore other than the direction in which the hyphae extend is in the increase in the density of the hyphae as they pass into the hymenophore. The plants of this type belong in Fries' genus *Polyporus*. However, this arrangement of the hyphae in the hymenophore is far from general

---

[1]) *Polyporus alboluteus—Polyporus humilis.*

[2]) *Fomes roseus—Polyporus frondosus.*

for the plants of this genus. Species quite closely related in other characters differ in this respect[1]).

Patouillard cites the genus *Leptoporus* Quél., as especially characterized by possessing a hymenophore which forms a layer distinct from the pileus. The plants placed by him in *Leptoporus* constitute a rather heterogeneous group, so it is difficult to say what is meant by the statement that the tubes form a distinct layer. The majority of species included in this genus, judging from those available for study, have a denser tissue in the hymenophore, but that is also true of some species which he has placed in other genera. He also includes *Gloeoporus conchoides* with separable hymenophore and *Polyporus fumosus* and *Polyporus adustus*, all of which have a different relation between the pileus and hymenophore.

It is thus evident that the relation of the hymenophore to the pileus as a character in classification has not been used in a way entirely consistent with the structure of the plants under consideration. The great variation of this character in species which are evidently congeneric makes it difficult to use it to any extent in the establishment of genera. It is probable that the study of a sufficient number of forms would make it valuable in determining the relationship among members of a genus rather than as a basis for divisions into genera. The separable hymenophore is a character which at least in the forms here mentioned might be given generic value.

The form of the pores. The first divisions of the plants at present included in this group were made on the shape of the pores as is seen in the recognition of *Polyporus* and *Daedalea* as distinct genera. The typical polypore is usually thought of as possessing a circular pore. Although there are many species with circular pores, there are equally many in which the pores are variously angled, irregular and elongated (Figs. 64, 65). Some are regularly angled as in the genera *Hexagona* and *Farolus*, but more often they are irregular (Figs. 66, 67). In some forms the pores early become lengthened by the cessation of development of some or all the transverse walls, and greatly elongated pores are formed. Labyrinthiform pores result in these when some of the radial walls do not develop. In some species there are many such intricately winding passages and undeveloped walls can be seen in the base of the pore (Figs. 68, 69). When the transverse walls are reduced and the radial walls are thin, lamellae similar to these of the *Agaricaceae* are formed (Figs. 70, 71). Ring like pores, such as are found in the genus *Cyclomyces* are formed, if only the transverse walls are developed (Fig. 77).

In general, the shape of the pore is a constant character. Species with regular pores usually show little variation in their shape in different

[1]) *Polyporus frondosus* and *Polyporus berkleyi*; *Polyporus ovinus* and *Polyporus radicatus*.

plants, and individuals of species where the pores are irregular show like variations. There are some exceptions to this, however. There are a few species in which pores of different individuals are so unlike that they have been placed in separate genera (Figs. 72, 72a).

The size of the pores. Although there is some variation in the size of pores in individual plants the average size in different plants of the same species is about the same. Marked differences are seen, however, when different species are examined. The average size of the pores in general would probably be from .3 to .4 mm. in diameter. Buller[1]) states that tubes .2 to .25 mm. in diameter are as small as is consistent for safety in the liberation of spores. However, there are species in which the pores are no more than .1 mm. in width and hardly discernable with the unaided eye. Others are from 1 to 2 mm. in diameter, while some of the labyrinthiform pores are more than 3 cm. in length. The size of the pores is in no way correlated with the size of the fruit body. Usually plants with a loose spongy consistency have larger pores than those of firmer consistency.

The pore walls. Associated with the thickness of the pore partitions are modifications of the edges of the pore openings such as dentations, lacerations, etc. In some species the flesh separating the pores is so thick that the pores appear as cavities in a solid substance. In these, the edges of the pores are usually entire and smooth. Pores of this kind are more often found in perennial forms with hard smooth context. In other species the pore walls are very thin and often have uneven edges. Sometimes they are evenly dentate or fimbriate. Others become irregularly lacerated and when the slits progress to the base of the cavities the segments appear as hydnoid processes. Such plants can easily be mistaken for members of the *Hydnaceae*, especially when the walls are thus broken up in the young stages of the hymenophore (Figs. 73, 74).

The depth of the pores. This character has been considered by some to be of value in the separation of genera. The genus *Trametes*[2]) is said to frequently have pores of unequal depth. An examination of a number of the members of this genus, as well as others, show that the base of the pores form an even line and in the mature portions of the hymenophore the pores are of equal depth. In the greatly elongated pores of the genus *Daedalea*, the depth of an individual pore is not the same throughout, but the maximum depth the pores reach is the same. Although some variation was noted in plants of some of the species which have been described as having pores of unequal depth[3]), the differences were not found constant in all the specimens of a species examined and

---

[1]) Researches on Fungi, 36, 37. 1909.

[2]) Karsten Finl. Basids, 287. 1889. Saccardo. Syll. Fung. **6**: 91. 1888.

[3]) *Trametes pini. T. suaveolens. T. odorata. T. cinnabarina.*

such differences as were found to exist are no greater than are found in species which have been included in genera where the pores are said to be of equal depth. Judging from these observations, it may be said that there is not sufficient difference in the depth of the pores in any one pileus to make the character of any diagnostic value.

There is considerable difference however in the depth of the pores in different species. In some as *Polystictus crocatus*, the pores are so shallow that the hymenial surface appears almost smooth as in the *Thelephoraceae*, while in other species as *Daedalea quercina* they are more than a centimeter in depth.

As to the use of pore characters in classification it may be said that in general they are of little value in generic limitations, but they are among the most important characters in distinguishing species. Although the form of the pores has been widely used in classification, the establishment of genera on this basis only separates species which otherwise are nearly related, and it is doubtful if it can be used extensively in any natural grouping of plants.

Color. Although color is not so conspicuous in these plants as in some groups, there is considerable variation. Many of the plants are white, some are tinged with brown, grey or lavender. Others are brightly colored in red, blue or yellow, while some are deep brown to almost black. Sometimes the entire fruit body is the same color; occasionally the hymenophore is of a different color from the pileus. Zonation of the pileus surface, especially characteristic of some species, is due to the deposit of coloring matter in some of the surface cells in concentric zones. All of these variations are of more or less value as specific characters. These outward color characters are however changeable, especially with age and in some cases vary with the intensity of the light[1]).

The color of the trama is of more importance. The hyphae are either hyaline or some shade of brown, varying from the deep purple brown shades to orange, red and very pale fulvous. Few authors have regarded the color of the context of value in the limitation of genera. There are a few plants in which color seems to be correlated with other characters of generic value. Often, however, plants which are much

[1]) Miss Bayliss (Journ. Econ. Biol. 3[1]: 16. 1908) has stated that the coloring which produces the zonation in *Polystictus versicolor* is not present when the fruit bodies develop in diffuse light. The pilei are of a uniform buff color. Specimens of *Polystictus versicolor* collected by Prof. Atkinson in a coal mine at Wilkesbarre, Pa., show a similar absence of dark coloring matter. These fruit bodies were developed in complete darkness, although Miss Bayliss obtained only abortive fruit bodies in the absence of light. This was probably due to the abnormal laboratory conditions.

alike otherwise, have a context of different color. In such natural groups it is difficult to separate the plants of colored context from those of white context since the gradations of color are so gradual. This is seen in the two genera, *Coriolus* Quél. and *Coriolopsis* Murr. as distinguished by Murrill. The genus *Coriolus*, which is supposed to contain only species with white context includes some that are distinctly colored, as *Coriolus sector*. Some variations occur in plants of the same species. For example, *Fomes applanatus* usually has a deep brown color, but occasionally one sees specimens in which the context is nearly white. The part that color plays in plants is little known, and since plants otherwise nearly related differ in color, its use in anything other than specific distinctions seems hardly justifiable, except when it is correlated with other characters of generic value.

Spore characters. Spore characters have not been used so extensively in classification in the *Polyporaceae* as in the *Agaricaceae*, because the spores are often difficult to find and are as a result unknown in many species. They show the usual variations exhibited by spores in a large group of plants. They vary in shape from round and oval to oblong and allantoid and may be smooth, angled or echinulate. In color they are hyaline, yellowish or some shade of brown. Spore characters are among the most valuable in defining specific limits and complete data on these characters would give much of value in determining the relationship of species. No spore characters other than color have been used in defining genera. If color is to be used as one of the factors in determining generic limits, it is better to use the color of the spores rather than the color of the context, since this is in accordance with usage in other groups of fungi.

Cystidia. Cystidia are found in only a few species of the *Polyporaceae*. They are the modified ends of some of the trama hyphae which extend into the hymenial layer and usually come to the surface.

Two types were observed in the species studied. Those in the nature of spines were found only in the plants of deep brown context (Figs. 75, 75 a, 75 b). They are generally found in the hymenium, although they are sometimes found buried in the pileus tissue. One section of *Trametes pini* examined, showed many spines placed in this way. These cystidia are of common occurrence in a number of species, but their abundance varies greatly in different specimens. An occasional cystidium was found in plants in which they are not recorded as occurring in (*Polyporus texanus* and *Polyporus radiatus*).

Ellis[1]) founded the genus *Mucronoporus* to include plants possessing these spines. A number of plants quite unlike in other characters were

[1]) Jour. Myc. **5**, 28. 1889

placed in this genus. Karsten[1]) because of the presence of spines in *Polystictus circinatus* made it the type of a new genus *Onnia*.

Another kind of cystidium is found in the inflated rounded ends of hyphae. Hartig[2]) has described and illustrated those in *Polyporus borealis*. The upper half of the cystidium is thick-walled, and the lower half thin-walled. The thin walled portion collapses with the drying out of the fruit body. In *Fomes graveolens* there are clavate thin-walled cystidia (Fig. 76) scattered throughout the tissues of the fruit body. The inflated end often collapses and the remnant is left in the cavity thus formed (Fig. 76 a). The swollen ends of hyphae occurring in *Polyporus pendulus* are probably in the nature of cystidia and similar to those present in *Fomes graveolens*.

The presence of cystidia, although useful in distinguishing species, is too variable and uncertain a character to be of generic value.

Conclusions. The foregoing study of the many characters used in the distinction of genera shows how difficult it is to employ any one character to the exclusion of others. In the recognition of genera, a complex of characters rather than separate characters must be considered. Different structures, however, do not have the same relative importance, sometimes because of variations, at other times because they do not show relationship among species, but are merely the expression of individual peculiarities.

From these studies it seems to me that the broader relationships within the *Polyporaceae* are best shown in the character of the flesh or the consistency of the fruit body. Although it is a character which is not clearly shown by definite structures, when used as a basis for sections of the family, it brings the species into more natural groups than a division on any other character would. The difficulty in using a system where preference is given to such a character as this, can only be met by some experience and judgment in the interpretation of it. Characters such as the form of the fruit body or the form of the pores are much more easily discerned, but have less value if taken alone. With the consistency as a basis, the *Polyporaceae* can be divided into natural groups. These can be further separated into genera on the surface modifications, the form of the fruit body and some of the hymenophore and spore characters.

Upon this basis, a tentative arrangement of some of the species of temperate North America is here worked out to indicate the generic concepts which the author believes can be drawn as a result of this study.

---

[1]) Finl. Basidsv. 326. 1889.

[2]) Die Zersetzungserscheinungen des Holzes etc. 55. 1878.

The entirely resupinate species are not included, as few correctly determined species were available for study. However, in the classification of these species, instead of placing them in a separate group because of the form of the fruit body, as has been done by many workers, a more natural arrangement would be to group them in genera near the pileate species to which they are related in consistency and other characters.

In connection with each genus is given the most important generic synonymy. This is followed by a brief diagnosis of the genus, and a list of the species which have been studied. A key to the genera is arranged, as this will assist in their recognition and diagnosis.

The author has attempted to follow the international rules of nomenclature adopted at Vienna (1905) and Brussels (1910). Since the list of genera conservanda provided for at Brussels has not yet been decided upon, the generic names selected here may not coincide with those to be adopted, and they are to be regarded rather as standing for what the author believes may be taken as natural groups of species indicating generic concepts. The name *Polyporus* is selected for what was called the "Ovini" section by Fries, since it has been used for the first section of the old genus by many authors in the most important systematic works of fungi from Fries' time until within comparatively recent years.

Key to Genera.

A. Trama of the pileus and hymenophore of similar consistency.
  BB. Pileus fleshy-tough to coriaceous when fresh becoming rigid, corky or cartilagenous and sometimes friable when dry. Spores hyaline.
    C. Pileus fleshy-tough, often moist and watery, becoming rigid and friable or corky when dry.
      D. Pileus surface anoderm or with a slight non-separable pellicle.
        E. Hymenophore not arising from a distinct layer. Pileus usually rigid or friable when dry. Polyporus.
        EE. Hymenophore arising from a distinct layer. Pileus rigid to corky when dry . Bjerkandera.
      DD. Pileus surface with a pellicle, separable in age or thinly encrusted; pileus corky when dry.
        E. Surface thinly encrusted; hymenophore not separable in age.
          F. Hymenophore not concealed by a veil continuous with the pileus surface; pileus encrusted with compact upright cells Ischnoderma.

FF. Hymenophore concealed by a veil continuous with the pileus surface and of the same structure; surface thinly encrusted, sometimes varnished . . . . . Cryptoporus.

EE. Surface pelliculose; hymenophore separable in age . . . . . Piptoporus.

CC. Pileus fleshy-coriaceous, very firm when fresh, rigid cartilagenous when dry.

E. Pileus not pendent, stipitate; surface anoderm or with a slight pellicle; pores round to alveolate and angled . . . . . Favolus.

EE. Pileus pendent; surface thinly encrusted with upright hyphae; pores round . Poronidulus.

CCC. Pileus soft fleshy-spongy when fresh; spongy and sometimes friable when dry . . . . . Phaeolus.

BB. Pileus suberose, woody, rigid coriaceous or dry, fibrous when fresh[1]), changing little when dry; spores hyaline or brown.

C. Pileus coriaceous to suberose; spores hyaline.

D. Pileus thin, usually coriaceous even when dry; hymenophore with pores usually round, a few labyrinthiform, dissepiments sometimes lacerated . . . Coriolus.

DD. Pileus usually thick, corky, rigid, especially when dry.

E. Hymenophore with round pores . . Trametes.

EE. Hymenophore usually with labyrinthiform pores or lamellate . . . . . Daedalea.

CC. Pileus fibrous, spongy or corky, a few species fleshy-spongy when fresh; usually quite friable when dry, spores brown Polystictus.

CCC. Pileus usually hard and woody, sometimes punky; hymenophore often layered; surface often encrusted, sometimes varnished, spores hyaline or brown.

D. Pileus very hard; surface usually anoderm, often rimose and furrowed, occasionally encrusted in age; spores hyaline or brown; context brown or red Phellinus.

DD. Pileus woody to corky; surface anoderm or slightly encrusted; spores hyaline; contex white to light colored or pale brown . . . . . Fomes.

---

[1]) A few species included in this section, in the rapidly growing portions of the fruit bodies are somewhat fleshy tough, especially during moist weather. *P. dryadeus* and *P. hispidus* are among these. The maturer portions of the fruit body are however always hard or corky.

DDD. Pileus punky, corky to woody; surface heavily encrusted from the beginning; spores pale or dark brown with darker lines in the spore walls . Ganoderma.

AA. Trama of the pileus and hymenophore of unlike consistency, hymenophore gelatinous, pileus coriaceous . . . . . Gloeoporus.

Polyporus Fr. Syst. Myc. **1**, 341, 1831.

Merisma Gill. (pr. p.) Champ. Fr. 668. 1878.
Bjerkandera Karst. (pr. p.) Medd. Soc. Faun. Fl. Fenn. **5**: 58. 1879.
Tyromyces Quél. Rev. Myc. **3**: 17. 1881.
Caloporus Quél. (pr. p.) Ench. Fung. 164. 1886.
Cladomeris Quél. Ench. Fung. 167. 1886.
Leptoporus Quél. (pr. p.) Ench. Fung. 175. 1886.
Spongipellis Pat. Hymen. Eur. 140. 1887.
Laetiporus Murr. Bull. Torr. Bot. Club. **31**: 607. 1904.
Abortiporus Murr. Bull. Torr. Bot. Club. **31**: 421. 1904.
Spongiporus Murr. Bull. Torr. Bot. Club. **32**: 474. 1905.
Aurantiporus Murr. Bull. Torr. Bot. Club. **32**: 487. 1905.
Scutiger [Paulet] Murr. N. Am. Fl. **9**: 64. 1907.
Grifola [S. F. Gray] Murr. N. Am. Fl. **9**: 68. 1907.

Fruit body annual, stipitate, sub-stipitate or sessile, simple, or branched; surface anoderm or with a slight non-separable pellicle; consistency soft, fleshy-tough to fibrous when fresh, sometimes sodden and watery, to hard, rigid or friable and fragile or cheesy when dry: a few partially spongy, watery when fresh to firm and hard when dry; context usually white, sometimes bright colored, yellowish or reddish; spores hyaline.

a) Stipitate, usually simple. — *Polyporus ovinus*, Fr. ex Schaeff., *P. radicatus* Schw., *P. cryptopus* Ell. and Barth., *P. caeruleoporus* Pk., *P. holocyaneus* Atk., *P. griseus* Pk., *P. distortus* Schw.[1]), *P. ellisii* Berk.

aa) Stipitate, usually branched. *P. frondosus* Fr. ex. Dicks., *P. umbellatus* Fr. ex Pers , *P. berkeleyi* Fr., *P. poripes* Fr.

aaa) Sessile.

b) Pileus trama homogeneous. *P. chioneus* Fr., *P. caesius* Fr., *P. semipileatus* Pk., *P. spraguei* B. & C., *P. caesiosimulans* (Atk.), *P. subpendulus* (Atk.), *P. lacteus* Fr., *P. semisupinus* B. & C., *P. guttulatus* Pk., *P. palustris* B. & C., *P. fumidiceps* (Atk.), *P. pilotae* Schw., *P. smallii* (Murr.), *P. undosus* Pk.

[1]) *Polyporus distortus* was included by Patouillard in the Trametes section of the genus Daedalea along with Daedalea biennis. Murrill places it in a distinct genus Abortiporus. The fresh material as well as the dried specimens examined by the writer show that although somewhat tougher, it resembles species of Polyporus in consistency and form. For that reason it is placed in this genus.

bb) Pileus spongy above, denser below. *P. borealis* Fr., *P. galactinus* Berk., *P. unicolor* Schw., *P. leucospongia* Cke. & Hark., *P. occidentalis* (Murr.), *P. delectans* Pk., *P. fissilis* B. & C.

The splitting of this genus into many has been in part, on the presence and absence of a stipe and whether the stipe is simple or branched. As previously stated, it is a character which can hardly be considered of generic value. All gradations are found in this group between the stipitate and nonstipitate forms and between simple and branched stipes.

The character of the tissue in these plants varies considerably. In most of the species the hyphae extend predominantly in the direction of the growth, some in parallel strands, others very much tangled and interwoven, so that no definite direction of growth can be made out. In all examined except one or two species the tissue of the hymenophore was denser than that in the trama of the pileus.

The species with a partially spongy pileus are usually plants of considerable size and have been placed by some in a separate genus, *Spongipellis* Pat. Aside from the duplex character of the pileus they are structually like *Polyporus*. Sometimes specimens of the species are found in which the duplex character of the trama is wanting or made out with difficulty. It is a character which has not been considered of generic rank in other plants. *Polystictus circinatus* differs from other species of *Polystictus* in having a spongy surface layer in the pileus but is usually included with species of uniform context, and when separated from these species it has been because of cystidia and not because of the duplex character of the pileus tissue. *P. leucospongia* placed by Murrill in a separate genus *Spongiporus*, has the duplex character of tissue in the pileus as found in *P. borealis*, but the upper layer of the pileus is of a very loose tissue and the lower layer somewhat spongy so that the fleshy, fragile or rigid portion is limited to the hymenophore. *P. pilotae* Schw. placed by Murrill in a distinct genus *Aurantiporus*, is not so unlike some of the large tough species as *P. guttulatus* and *P. palustris*, that it need be separated from them.

Bjerkandera Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 38. 1879.

Merisma Gill. (pr. p.) Champ. Fr. 688. 1876.

Leptoporus Quél. (pr. p.) Ench. Fung. 177. 1886.

Fruit body annual, sessile, fleshy tough to coriaceous when fresh, becoming corky and rigid when dry; surface anoderm; context white; hymenophore arising from a distinct layer; spores hyaline.

Bjerkandera adusta (Fr.) Karst., *B. fumosa* (Fr.) Karst., *B. puberula* (B. & C.) Murr.

The arrangement of the hyphae in the tissue of *Bjerkandera* is like that in *Polyporus*. They are however more densely interwoven and the pileus is of less fleshy consistency. The hymenophore also arises from

a distinct layer. If these differences should not be considered sufficient for a distinct genus the plants should be placed with *Polyporus*.

Ischnoderma Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 38. 1879.

Fruit body annual, sessile, fleshy-tough when fresh, becoming corky and woody when dry; surface thinly encrusted by an uneven layer of upward growing thick walled hyphae; context light brown; tubes small, thin walled; spores hyaline.

Ischnoderma resinosum (Fr.) Karst. ex Schrad., *I. benzoinum* (Fr.).

These plants are much like some of the tougher species of *Polyporus* and if not considered as belonging to a distinct genus had best be placed with them. The surface, however, of the other species included in *Polyporus* is anoderm, while these species are thinly encrusted. The upward-growing surface cells as previously described are arranged somewhat like those in *Ganoderma*. They do not form so thick and uniform a layer and are only slightly encrusted.

Cryptoporus Hubbard[1]). Can. Ent. **24**: 250. 1892.

Cryptoporus Pk. (as section of the Placodermei of Polyporus) Bull. Torr. Bot. Club **7**: 104. 1880.

Cryptoporus Shear. Bull. Torr. Bot. Club **29**: 450. 1902.

Fruit body annual, sessile, soft corky, ungulate to globose; context white; surface encrusted; tubes at first concealed by a firm corky veil which is continuous with the outer surface of the pileus and which breaks at maturity; spores smooth, hyaline.

Cryptoporus volvatus (Pk.) Hubbard.

Piptoporus Karst. Rev. Myc. **3**: 17. 1881.

Polyporus Fr. (pr. p.) Syst. Myc. **1**: 358. 1821.

Fruit body annual, ungulate, umbonate, fleshy to corky; context white; surface covered by a pellicle which is exfoliated in age, hymenophore separable in age; spores hyaline.

Piptoporus betulinus (Fr.) Karst., ex Bull.

Favolus Fr. Elench. 444. 1828.

Polyporus Fr. (pr. p.) Syst. Myc. **1**: 145. 1821.

Polyporellus Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 37. 1879.

Leucoporus Quél. Ench. Fung. 165. 1886.

Cerioporus Quél. Ench. Fung. 167. 1886.

Melanopus Pat. Hymen Eur. 137. 1887.

Microporellus Murr. Bull. Torr. Bot. Club **32**: 483. 1905.

---

[1]) Peck (27th Rept. N. Y. State Mus. 98, 1875) described the type of this genus as Polyporus volvatus. Later he proposed the name Cryptoporus for it as a new section of the genus. Shear raised Cryptoporus to generic rank. Professor Atkinson has called my attention to an article by Hubbard entitled "Inhabitants of a Fungus", appearing in the Canadian Entomologist in 1892. In this the combination, *Cryptoporus (Polyporus) volvatus* is used, antedating by several years Shear's use of the name as a genus.

Fruit body annual, stipitate, stipe simple, central, excentric or lateral; surface anoderm; consistency fleshy-coriaceous when fresh, to rigid-cartilagenous or corky when dry; context white; pores round to alveolate or four to six sided and often radially elongated; spores smooth, hyaline.

Tubes round, *Favolus brumalis* (Fr.) ex Pers., *F. elegans* (Fr.), *F. underwoodii* (Murr.), *F. fissus* (Berk.), *F. dealbatus* (B. & C.), *F. fagicola* (Murr.), *F. delicatus* (B. & C.).

Tubes alveolar to angled. *F. squamosus* (Fr.) ex Huds., *F. alveolaris* Fr., *F. striatulus* E. & E., *F. cucullatus* Mont., *F. arcularius* (Fr.), *F. curtisii* Berk.

The forms with round pores (*F. brumalis* etc.) are here placed under *Favolus* because aside from the form of the pores they do not seem to differ from species like *F. alveolaris* and *F. cucullatus*. All of these plants are of similar consistency and form. Several of the species included in the genus of round pored plants (*Polyporus* Fr., *Polyporellus* Karst. etc.) have pores which are alveolar and radially elongated and angled. These species easily connect the two groups and there seems no good reason for separating them on the single character of pore form.

The trama hyphae in the greater number of species are much tangled and interwoven, and forming a homogeneous tissue, descend into the hymenophore either unchanged (*F. alveolarius*, *F. brumalis*, *F. arcularius*) or slightly condensed (*F. cucullatus*, *F. elegans*, *F. underwoodii*, *F. squamosus*). *F. dealbatus* differs from the other species studied in that the densely packed trama hyphae extend parallel to the surface and descend into the hymenophore parallel with the pores. The resulting tissue is fibrous and very rigid.

Porodisculus Murr. N. Am. Fl. **9**: 47. 1907.

Enslinia Fr. Summa Veg. Scand. 399, 1849.

Fruit body annual, turbinate, cub shaped, erumpent through lenticels, pileus usually pendent; consistency somewhat fleshy-tough when fresh, becoming very hard and rigid when dry; surface of the pileus and pore mouths villous because of hyphae with enlarged ends, terminating at the surface; spores globose, hyaline.

Porodisculus pendulus (Schw.) Murr.

Phaeolus Pat. Tax. Hymen. 86. 1900.

Hapalopilus Karst. Rev. Myc. **3**: 18. 1881.

Aurantiporellus Murr. Bull. Torr. Bot. Club **32**: 486. 1905.

Pycnoporellus Murr. Bull. Torr. Bot. Club **32**: 489. 1905.

Fruit body annual, stipitate, sessile or effused, soft, spongy throughout when fresh, spongy when dry; surface anoderm; context brown, red or yellow, spores hyaline.

Phaeolus schweinitzii (Fr.), Pat. *P. fibrillosus* (Karst.) Pat., *P. nidulans* (Fr.) Pat., *P. alboluteus* (E. & E.).

The plants included here, although differing from one another in the form of the fruit body, are alike in other characters. They are of spongy

consistency with a very loose arrangement of hyphae in the pileus. In *P. schweinitzii*, *P. fibrillosus* and *P. nidulans*, the hyphae are slightly denser as they descend into hymenophore. In *P. albotuleus* the tissue is uniform throughout the fruit body.

Coriolus Quél. Ench. Fung. 175. 1886.
Polystictus Fr. (pr. p.) Nov. Sym. Myc. 70. 1851.
Irpex Fr. (pr. p.) Elench. 142. 1828.
Hansenia Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 39. 1879.
Poronidulus Murr. Bull. Torr. Bot Club **31**; 425. 1904.
Irpiciporus Murr. Bull. Torr. Bot. Club **32**: 471. 1905.
Coriolopsis (pr. p.) Murr. Bull. Torr. Bot. Club **32**: 358. 1905.
Cerrenella Murr. Bull. Torr. Bot. Club **32**: 361. 1905.
Cerrena Murr. ex S. F. Gray. Bull. Torr. Bot. Club **32**: 97. 1905.

Fruit body annual, sessile, thin, fibrous-coriaceous; surface hairy or glabrous; context white or brown; tubes round to sinuose in some species, mouths entire or splitting into irpiciform teeth; spores hyaline.

Mouths of tubes entire. *C. versicolor* (Fr.) Quél. ex L., *C. sector* (Fr.) Pat., *C. ectypus* (B. & C.) Pat., *C. hirsutus* (Fr.) Quél., *C. pavonius* (Hook.) Murr., *C. crocatus* (Fr.), *C. conchifer* (Schw.) Pat., *C. planellus* Murr., *C. pubescens* Fr., *C. brachypus* (Lév.) Murr., *C. sericeohirsutus* (Klotzsch) Murr.

Tubes soon breaking into irpiciform teeth. *C. biformis* (Klotzsch) Pat., *C. lacteus* (Fr.) Pat., *C. mollis* (B. & C.), *C. prolificans* (Fr.) Murr., *C. ravenelii* (Berk.), *C. farinaceus* (Fr.), *C. abietinus* (Fr.) Quél. ex Dicks., *C. unicolor* (Fr.) Pat.

The pilei of the species included in this genus are thin and usually fibrous. The hyphae in the pileus extend parallel with the surface and in the hymenophore are parallel with the pores. In practically all the species studied the hyphae are no more compacted in the hymenophore than in the pileus. In *C. pubescens* they are slightly denser. *C. lacteus* and *C. mollis*, with pore walls early breaking into teeth differ so little from *C. prolificans* and *C. abietinus* that there seems no reason for placing them in a distinct genus (*Irpiciporus* Murr.). *C. farinaceus* and *C. ravenelii* (Cerrenella Murr.) are like *C. mollis* in the consistency and the character of the pores. The context is deep brown instead of white as in *C. mollis*. Color unless associated with other characters does not seem of sufficient value for generic distinctions. *C. conchifer*[1]) is characterized by the usual presence

[1]) The cup like structures at the base of the pileus are thought by some to be sterile pilei preceding the fertile pilei, others regard them as abortive growths arising the second year from the old pileus. That these structures are not always sterile, but often develop a normal hymenophore on the lower surface, is seen on examining a number of specimens.

In order to find if the pilei were preceded by the cup like base, the development of a number of fruit bodies was followed. Some elm branches infected

of a sterile cup like base. However, under conditions favorable for uninterrupted growth the fruit bodies mature without any indication of such a structure. In other ways it is like typical species of this genus and belongs with them. *C. unicolor* (*Daedalea unicolor* Fr.) has a thin fibrous pileus like other species included in this genus. It differs in having sinuose pores. This does not form a great distinction as there are other species of *Coriolus* which at times have sinuose pores. *C. abietinus* is one of these.

Trametes Fr. Gen. Hymen. 11. 1836.
Antrodia Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 40. 1879.
Pycnoporus Karst. Rev. Myc. **3**: 18. 1881.
Funalia Pat. Tax. Hymen. 95. 1900.
Pogonomyces Murr. Bull. Torr. Bot. Club **31**: 609. 1904.
Coriolellus Murr. Bull. Torr. Bot. Club **32**: 481. 1905.
Coriolopsis Murr. (pr. p.) Bull. Torr. Bot. Club **32**: 358. 1905.

Fruit bodies annual, sessile or semi-resupinate, corky to woody, rigid, context white or brown, pores round to irregular, spores hyaline.

Trametes suaveolens Fr. ex L., *T. cubensis* (Mont.) Sacc., *T. serialis* Fr., *T. rigida* Berk. & Mont., *T. sepium* Berk., *T. mollis* (Sommerf.) Fr., *T. cinnabarina* Fr., *T. hydnoides* Fr., *T. stuppea* Berk.

Difficulties arise in separating *Trametes* from *Coriolus*. *Trametes* has here been limited to species of rigid corky consistency while the species included in *Coriolus* have thin, coriaceous pilei. The hyphae in *Trametes* are usually somewhat tangled and interwoven and form a tissue homogeneous throughout the fruit body.

Daedalea Pers. Fr. Syst. Myc. **1**: 331. 1821.
Lenzites Fr. Gen. Hymen. 10. 1836.
Gloeophyllum Karst. Bidr. Finl. Nat. Folk. **37**: x. 79. 1882.
Lenzitina Karst. Finl. Basidsv. 337. 1889.

Fruit body annual, sessile, coriaceous to tough, corky and almost woody; surface anoderm; smooth or hairy; context white to light brown; hymenophore poroid to labyrinthiform and lamellate; spores hyaline.

---

with the mycelium of this fungus and bearing a few old fruit bodies were collected in the autumn and placed in the green house. Fruit bodies began to appear in March. They developed rapidly and were mature within a month. Some thirty pilei were thus grown, and all developed a normal hymenophore with no indication of being preceded by a sterile pileus. It seems probable since the sporophores are short lived at best, that the marginal hyphae are killed by unfavorable conditions. The abortive pilei at the base of the sporophore represent these dead fruit bodies. In some the hymenophore has developed, in others the lower surface is sterile. With the return of growing conditions, a new pileus is pushed out from the same aperture, or in some cases appears to grow from the living hyphae at the base of the old pileus, or from some point between the base and margin.

Daedalea quercina Fr. ex L., *D. confragosa* Fr. ex Pers., *D. aesculi* (Schw.) Murr., *D. elegans* Fr. ex Spreng., *D. betulina* Fr., *D. striata* Fr., *D. trabea* Fr., *D. saepiaria* Fr.

This genus differs from *Trametes* only in the form of the hymenial surface. The pilei are thicker and of a more corky consistency than *Coriolus*. The plants included in *Coriolus*, *Trametes* and *Daedalea* constitute the series *Trametes* of Patouillard[1]). He states that the plants of this series are so nearly alike that any natural grouping of the species is impossible. All of the plants are said to be distinguished by the tubes being hollowed out of the pileus as it were without any change in its substance. As was pointed out by Fries, there are two types of hyphal arrangement, 1st, that represented by species in which the hyphae of the hymenophore are vertically opposed to those in the pileus; 2nd, those in which there is no visible change in the hyphae as they descend into the hymenophore. The many gradations, however, between the two types make any separation of species on this basis impossible. Although the hyphae are of the same arrangement and density in the hymenophore and pileus, it can hardly be considered as characteristic for the group. As has been previously shown, the same is equally true of plants in other groups. The plants, however, have other distinguishing characters which separate them from other groups. They are of a tough, coriaceous to corky consistency and have hyaline spores. Some of the firmer species approach species of *Fomes*, like *Fomes connatus*.

Patouillard also states that the variations on which the genera of these plants have been based are often no more different than in different species of the same genus, or even in the same species. In this, he probably had in mind the configuration of the hymenial surface. Great variation in this character is evident, and any separation of genera made on it, is more or less artificial. For that reason Patouillard's arrangement of placing the species usually included in the genera *Lenzites* and *Daedalea* in one genus is here followed. The pore walls in the species of *Daedalea* are often as thin as the lamellae of *Lenzites*, while the latter usually anastomose more or less like the pores of the former genus.

The genera as arranged here are established on the configuration of the hymenial surface and the consistency of the pileus. Such differences as are recognizable in the latter character are due in a large part to differences in the thickness of the pilei so that these three genera do not represent distinct natural groups, but only a separation of species for convenience in arrangement.

[1]) The series Trametes of Patouillard includes the genera Coriolus, Trametes, Lenzites, Funalia and Daedalea. Funalia is composed of species of Trametes which have a very hairy surface covering which gives a duplex character to the pileus. Daedalea includes the stipitate daedaloid forms with a duplex pileus while the sessile species are united with the species of Lenzites.

Polystictus Fr. Nov. Sym. Myc. 70. 1851.
Inoderma Karst. Medd. Soc. Faun. Fl. **5**: 25. 1879.
Pelloporus Quél. (pr. p.) Ench. Fung. 166. 1886.
Inodermus Quél. Ench. Fung. 173. 1886.
Onnia Karst. Finl. Basidsv. 326. 1889.
Mucronoporus E. & E. (pr. p.) Jour. Myc. **5**: 28, pl. 8. 1889.
Xanthochrous Pat. (pr. p.) Cat. rais. Pl. cell. Tunisie 51. 1897; Gen. Hymen. 100. 1900.
Coltriciella Murr. Bull. Torr. Bot. Club **31**: 348. 1904.
Cycloporus Murr. Bull. Torr. Bot. Club **31**: 423. 1904.
Coltricia [S. F. Gray] Murr. Bull. Torr. Bot. Club **32**: 363. 1905.

Fruit body annual, stipitate or sessile; surface anoderm; consistency dry fibrous and somewhat friable to spongy or corky; context yellow to brown; tubes round, usually thin walled, edges often toothed or radial dissepiments breaking down or aborted, leaving concentric lamellae; spores smooth, brown.

Pores round. *Polystictus tomentosus* (Fr.) Cke., *P. perennis* (Fr.) Karst. ex L., *P. dependens* (B. & C.) Sacc., *P. cinnamomeus* Sacc. ex Jacq., *P. obesus* (E. & E.), *P. focicola* (B. & C.), *P. hispidus* (Fr.), *P. perplexus* (Pk.), *P. radiatus* (Fr.).

Pore walls becoming lamellate. *P. greenii* (Berk.).

In the plants of this group the hyphae extend parallel to the surface in the pileus. As they descend into the pores they either become much tangled and interwoven forming a loose spongy tissue as in *P. perennis* and some closely related species or they extend downward parallel to the pores as in *P. perplexus*.

P. tomentosus differs from the other species included here by having a duplex arrangement of hyphae in the pileus with a spongy tissue above and a fibrous tissue below.

C. dependens (*Coltriciella dependens* (B. & C.) Murr.) does not differ from the other plants except in the position of the pileus. This does not seem a sufficient reason for placing it in a separate genus.

P. greenii in structure, consistency and spore characters is like the other species included here, especially those with a thick pileus as *P. obesus*. The radial pore walls are often aborted, resulting in the formation of concentric lamellae. Because of this character it has been considered a distinct genus (*Cycloporus* Murr.) by some.

Phellinus[1]) Quél. Ench. 172. 1886.
Fomes Gill (pr. p.) Champ. Fr. 682. 1878.
Mucronoporus Ell. (pr. p.) Jour. Myc. **5**: 28. 1889.

[1]) Murrill did not use the name Phellinus because Phelline had been previously used for a genus of flowering plants but proposed instead Pyropolyporus. According to Art. 57 of the International Rules of Botanical Nomenclature adopted at Vienna (1903) the name Phellinus is valid.

Xanthochrous Pat. (pr. p.) Cat. rais. Pl. cell. Tunisie 51. 1897; Gen. Hymen. 100. 1900.

Pyropolyporus Murr. Bull. Torr. Bot. Club **30**: 109. 1903.

Porodaedalea Murr. Bull. Torr. Bot. Club **32**: 367. 1905.

Fruit body usually perennial, sessile or somewhat effused, very hard, woody and sometimes corky; surface anoderm, usually furrowed and rough in age, sometimes encrusted and rimose; context brown or red; pores usually layered; cystidia often present; spores smooth, hyaline or brown.

Spores hyaline. *Phellinus igniarius* (Fr.) Quél., *P. texanus* (Murr.), *P. conchatus* (Fr.) Quél., *P. gilvus* (Schw.) Pat., *P. pini* (Fr.), *P. fulvus* (Fr.) Quél., *P. dryadeus* (Fr.).

Spores brown. *P. robiniae* (Murr.), *P. everhartii* (Ell. & Galw.), *F. bakeri* (Murr.), *P. earlei* (Murr.), *P. ribis* (Fr.) Quél., *P. dryophilus* (Berk.).

This genus is related to certain species of *Polystictus* on the one side and *Fomes* on the other. It has the brown context and some species the brown spores and cystidia of the former genus. The dense and firm tissues, the perennial fruit body and the layered hymenophore relate it to *Fomes*. A few species also become encrusted in age much like *Fomes pinicola*. Patouillard has placed the species with brown spores in a genus separate from those with hyaline spores. The species here included are so alike in everything other than spore characters that it seems less inconsistent to place them together than to consider those with brown spores in another genus with some quite different plants as Patouillard has done. *(Xanthochrous* sect. *conchati).*

Fomes Gill. Champ. Fr. 682. 1887.

Fomitopsis Karst. Rev. Myc. **3**: 18. 1881.

Ungulina Pat. (pr. p.) Cat. rais. Pl. cell. Tunisie 48. 1897; Gen. Hymen. 102. 1900.

Globifomes Murr. Bull. Torr. Bot. Club **31**: 424. 1904.

Fomitella Murr. Bull. Torr. Bot. Club **32**: 365. 1905.

Fruit body perennial, sessile, often ungulate, tough corky to woody; surface anoderm or encrusted; context white, light colored or brown; tubes stratose; spores hyaline.

Surface not encrusted. *Fomes roseus* (Fr.) Cke., *F. ohiensis* (Berk.) Murr., *F. fraxineus* (Fr.) Cke. ex Bull., *F. sagraeanus* (Mont.) Murr., *F. supinus* (Fr.) Cke., *F. officinalis* (Fr.), *F. populinus* (Fr.) Cke., *F. geotropus* Cke.

Surface encrusted. *F. pinicola* (Fr.) Sacc., *F. annosus* (Fr.) Cke., *F. graveolens* (Schw.) Cke., *F. fraxinophilus* (Pk.) Sacc.

The hyphae in this genus extend in more or less horizontal strands throughout the pileus and usually descend into the hymenophore parallel with the pores or diagonally across them and without change in density.

The species here included show considerable diversity in surface modifications. They vary from the species where the hyphae are only

slightly appressed at the upper surface as *F. roseus*, to those species which encrusted at least in age, have a dense, hard surface.

Some of the species without a crust as *F. connatus*, show relationship with *Trametes*. They are, however, more woody than *Trametes* and have a layered hymenophore.

F. graveolens was made the type of a new genus, *Globifomes*, by Murrill. The pilei of this species are very numerous, arise from a common stroma, and are closely imbricated. Structurally, it does not differ from other species of *Fomes*.

Ganoderma Karst. Rev. Myc. **3**: 17. 1881.
Fomes Gill. (pr. p.) Champ. Fr. 682. 1878.
Elfvingia Karst. Finl. Basidsv. 333. 1889.
Amauroderma Murr. Bull. Torr. Bot. Club **32**: 366. 1905.

Fruit body annual or perennial, sessile or stipitate, fibrous-woody to punky or corky; surface hard with a layer of upward growing hyphae which thicken and become encrusted and in some species varnished; context pale to dark brown; spores smooth, pale to dark brown, spore wall perforated with darker lines.

Ganoderma lucidum (Fr.) Karst., *G. sessile* Murr., *G. oregonense* Murr., *G. curtisii* (Berk) Murr., *G. subperforatum* Atk., *G. lobatum* (Schw.) Atk., *G. applanatum* (Wallr.) Pat. ex Pers., *G. fomentarium* (Fr.), *G. tornatum* (Pers.), *G. fasciatum* (Fr.), *G. sulcatum* Murr.

The hyphae in the species of *Ganoderma* studied extend in parallel lines more or less interwoven in the pileus and become denser as they descend into the hymenophore.

All the species examined *G. lucidum* (Fr.) Karst., *G. sessile* Murr., *G. oregonense* Murr., *G. polychromum* Murr., *G. pulverulentum* Murr., *G. curtisii* (Berk.) Murr., *G. argillaceum* Murr., *G. personatum* Murr., *G. nevadense* Murr., *G. praelongum* Murr., *G. sulcatum* Murr., *G. flaviporum* (Murr.), *G. tornatum* (Pers.), *G. applanatum* (Wallr.) Pat. ex Pers., *G. lobatum* (Schw.) Atk., *G. fomentarium* (Fr.) have spores as described by Atkinson for the first seven species above cited. They are smooth with dark lines extending into the hyaline or nearly hyaline wall from the darker spore content. In some species these lines are very dark, so they are easily mistaken for echinulations, especially in surface view, in others they are paler so the spore appears smooth.

All of the plants included in this genus have a heavily encrusted surface. In some of the species the surfaces are composed of a palisade layer of upright cells as previously described for *G. lucidum*, in others the upright enlarged hyphae are intermingled with unmodified hyphae *(G. tornatum)* and in still others as *G. applanatum* and *G. fomentarium* the upward growing hyphae are very densely interwoven and do not form a palisade layer.

Some of the species are characterized by a reddish varnish which covers the encrusted surface of the pileus and stipe. They constitute the genus *Ganoderma* Karsten as treated by Murrill. Some variation is seen in this character. *G. tornatum* (*Elfvingia tornata* (Pers.) Murr.) is sometimes partially varnished, while in *G. curtisii* the varnish of the pileus is almost if not entirely lacking. Unless correlated with other characters it does not seem of sufficient importance for generic distinctions.

Gloeoporus Mont. Hist. phys. Polit et natur. d'ile Cuba. 294. pl. 9, fig. 1. 1838—42; Ann. Sc. Nat. Bot. 2nd ser. **17**; 120. 1842.

Fruit body sessile, annual, pileus tough, coriaceous; hymenophore soft gelatinous when moist, hard and friable when dry, separable; surface anoderm; spores hyaline.

Gloeoporus conchoides Mont.

The genera *Cyclomyces* in the sense of Patouillard and *Cycloporellus* of Murrill have not been considered, as only a few specimens of the species were available for study. *Polyporus iodinus* Mont. is the only species included in these genera which occurs in the United States.

* * *

These studies were carried on in the Botanical Laboratory of Cornell University under the supervision of Professor George F. Atkinson, to whom the writer is much indebted for constant assistance and much kindly criticism. Acknowledgements are also due Dr. G. G. Hedgcock and Dr. W. A. Murrill for specimens and for courtesies shown when examining the collections in their charge.

Bibliography.

1. Atkinson, George F. Observations on Polyporus lucidus Leys and some of its Allies from Europe and North America. Bot. Gaz. **46**: 321—338, pl. 19. 1907.
2. — Notes on some new species of fungi from the United States. Ann. Myc. **6**: 54—62. 1908.
3. — On the Identity of Polyporus applanatus of Europe and North America. Ann. Myc. **6**: 179—191, pls. 2—4. 1908.
4. De Bary, Anton. Comparative morphology and biology of the fungi, mycetozoa and bacteria. Eng. Ed. London. 1887.
5. Bayliss, Jessie S. The Biology of Polystictus versicolor Fr. Jour. Econ. Biology. **31**: 1—24, pls. 1, 2. 1908.
6. Buller, A. H. Reginald. Researches on Fungi. London. 1909.
7. Ellis, J. B. and Everhart, B. M. Mucronoporus. Journ. of Mycol. **5**: 28—29, pl. 7. 1889.
8. Fries, Elias Magnus. Systema Mycologicum. **1**. Gryphiswaldia. 1821.

9. Fries, Elias Magnus. Elenchus fungorum. **1** & **2**. Gryphiswaldia. 1828.
10. — Eclogae Fungorum. Linnea. **5**: 497—553. 1835.
11. — Genera Hymenomycetum quorum novam expositionem. (Diss. acad.) Upsalia. 1836.
12. — Epicrisis systematis mycologici. Upsalia. 1836—38.
13. — Summa vegetabilium Scandinaviae. Holmiae et Lipsiae. Sectio posterior. 1849.
14. — Novae symbolae mycologicae. Act. R. Soc. Sci. Upsala. ser. 3, **1**. 1851.
15. — Hymenomycetes Europaei. Upsala. 1874.
16. Gillet, C. C. Les Champignons (Fungi Hymenomycetes) qui croissent en France. Paris. 1878—90.
17. Hartig, Robert. Die Zersetzungserscheinungen des Holzes der Nadelholzbäume und der Eiche. Berlin, 1878.
18. Hennings, Paul. Pilze in Engler & Prantl. Die Natürlichen Pflanzenfamilien. Teil I Abt. 1**. Leipsic. 1897—1898.
19. Hubbard, H. G. Inhabitants of a Fungus. Can. Ent. **24**: 250. 1892.
20. Karsten, P. A. Mycologia fennica. Pars tertia. Bidr. t. Kaennedom f. Finlands. Natur. och Folk. Helsingfors. 1876.
21. — Symbolae ad mycologiam fennicam. VI. (Meddel. af soc. pro Fauna et Flora Fennica. **5**: 15—46. 1879).
22. — Enumeratio Boletinarum et Polyporearum fennicarum systemate nove dispositarum. Rev. mycol. **3**: 16—19. 1881.
23. — Fragmenta mycologica. No. 3. Hedwigia **22**: 163. 1883.
24. — Kritisk ofversigt af Finlands Basidsvampar. Helsingfors. 1889.
25. Montagne, Camille. Troisième centurie de Plantes cellulaires exotiques nouvelles. Ann. Sc. Nat. Bot. 2nd ser. **17**: 119—129. 1842.
26. Murrill, W. A. The Polyporaceae of North America. I. The genus Ganoderma. Bull. Torr. Bot. Club **29**: 598—608. 1902; II. The genus Pyropolyporus. l. c. **30**: 109—120. 1903; III. The genus Fomes l. c. **30**: 225—232. 1903; IV. The genus Elfvingia l. c. **30**: 296—301. 1903; V. The genera Cryptoporus, Piptoporus, Scutiger and Porodiscus, l. c. **30**: 423—434; VI. The genus Polyporus, l. c. **31**: 29—44. 1904; VII. The genera Hexagona, Grifola, Romellia, Coltricia and Coltriciella, l. c. **31**: 325—348. 1904; VIII. Hapalopilus, Pycnoporus and new monotypic genera, l. c. **31**: 415—428. 1904; IX. Inonotus, Sesia and monotypic genera, l. c. **31**: 593—610. 1904; X. Agaricus, Lenzites, Cerrena and Favolus, l. c. **32**: 83—103. 1905; XI. A synopsis of the brown pileate species, l. c. **32**: 353—371. 1905; XII. A synopsis of the white and bright colored pileate species, l. c. **32**: 469—495. 1905; XIII. The described species of Bjerkandera, Trametes and Coriolus, l. c. **32**: 633—656. 1905.

27. Murrill, W. A. Polyporaceae (Agaricales) North American Flora, **9**, pts. I & II. 1907—1908.
28. Patouillard, Narcisse. Les Hymenomycètes d'Europe. Paris. 1887.
29. — Essai taxonomique sur les familles et les genres des Hymenomycètes. Lons-le-Saunier. 1900.
30. Peck, Chas. Polyporus volvatus. N. Y. State Mus. Rept. **27**, pl. 2, fig. 3—6. 1875.
31. — Polyporus volvatus Pk. and its varieties. Bull. Torr. Bot. Club **7**: 102—105. 1880.
32. Quélet, Lucien. Enchiridion fungorum. Lutetia. 1886.
33. Saccardo, Pier Andrea. Sylloge Fungorum. **6**. Pataviae. 1888.
34. Shear, C. L. Mycological Notes and new Species. Bull. Torr. Bot. Club **29**: 449—457. 1902.
35. Winter, Georg. Pilze in Rabenhorst's, Krypt.-Fl. v. Deutschland, Österreich u. d. Schweiz. Zweite Auflage. **1**. Abt. 1. Leipsic. 1883.

Explanation of Plates X—XIII.

The greater number of the figures are photo-micrographs made from sections 11 μ thick; unless otherwise stated they are magnified 38 diameters.

Figures 1, 6, 25, 31a, 30, 32, 55, 56, 57, 58, 75, 76 were drawn with the aid of a camera lucida and are magnified 960 diameters.

Fig. 1. A portion of a section through the stipe of *Polyporus elegans*, showing the modified surface cells.

Fig 2. Section through the pileus of *Polystictus circinatus*, showing the duplex character of the tissue, the fibrous tissue in the lower part of the pileus and the spongy tissue above.

Fig. 3. Section through the pileus of *Polystictus versicolor*, showing the hyphae parallel to the surface of the pileus, and descending into the hymenophore parallel to the pores.

Fig. 4. *Polystictus sector*. Same as Fig. 3.

Fig. 5. Section through the pileus of *Polystictus perennis*, showing the hyphae parallel to the surface of the pileus and intricately interwoven in the hymenophore.

Fig. 6. Section through the pileus of *Polyporus elegans*, showing a densely interwoven homogeneous tissue.

Fig. 7. *Favolus cucullatus*. Same as Fig. 6.

Fig. 8. Section through the pileus of *Polyporus betulinus*, showing the densely interwoven and homogeneous tissue in the pileus and the hyphae descending in the hymenophore more or less parallel to the pores.

Fig. 9. Section through the pileus of *Polyporus frondosus*, showing the hyphae parallel to the surface of the pileus and descending into the hymenophore slightly condensed and parallel to the pores.

Fig. 10. Section through the pileus of *Polyporus cryptopus*, showing the intricately interwoven hyphae and the slight condensation of the hyphae as they descend into the hymenophore.

Fig. 11. Section of the pileus tissue of *Polyporus lacteus*, showing the intricately interwoven hyphae which form a loose tissue.

Fig. 12. Section of *Polyporus borealis*, showing the duplex character of the tissue and the areas of dense fibers in the spongy tissue.

Fig. 13. Section of *Polyporus schweinitzii*, showing areas of dense fibers in the spongy tissue and the denser tissue in the hymenophore.

Fig. 14. Section of *Polyporus alboluteus*, showing the loose open tissue in the pileus which descends into the hymenophore unchanged.

Fig. 15. Section of *Polyporus leucospongia*, showing the very loose tissue in the pileus and the duplex character of it (section 22 μ thick).

Fig. 16. Section of the pileus of *Daedalea quercina*, showing the intricately interwoven hyphae forming a dense tissue.

Fig. 17. Section of *Fomes roseus*, showing hyphae in parallel strands in the pileus and descending without change into the hymenophore, parallel to the pores.

Fig. 18. Section of *Fomes connatus*. Same as Fig. 17.

Fig. 19. Section of a portion of the pileus of *Fames annosus*, showing hyphae in parallel strands in the pileus and agglutinated into a crust at surface. 19 a Same showing hyphae descending to hymenophore without change.

Fig. 20. Section of portion of pileus of *Trametes suaveolens*, showing hyphae ending loosely at the upper surface.

Fig. 21. Section of a portion of the pileus of *Polyporus borealis*, showing hyphae compacted into strands, free at the surface; figure inverted.

Fig. 22. Section of the pileus of *Polyporus sulphureus*, showing hyphae appressed at the upper surface.

Fig. 23. Section of the pileus of *Polyporus berkleyi*. Same as Fig. 22.

Fig. 24. Section of the pileus of *Polyporus chioneus* showing compacted hyphae which form a pellicle.

Fig. 25. Section of the surface of the pileus of *Polyporus fissus*, showing pseudo-parenchyma like tissue which covers the pileus.

Fig. 26. Section through the upper portion of the pileus of *Polyporus betulinus*, showing the line of cleavage along which the pellicle is exfoliated from the fruit body.

Fig. 27. Section of upper part of the pileus of *Polyporus planus*, showing the condensed and agglutinated hyphae at the upper surface which form the encrusted covering.

Fig. 28. *Daedalea mollis*. Same condition as Fig. 27.

Fig. 29. Section of upper surface of *Fomes ellisianus* showing the thick layer of compressed and agglutinated hyphae at the upper surface.

Fig. 30. Section through the crust of the pileus of *Ganoderma tornatum*, showing the layer of enlarged thick walled hyphae intermingled with unmodified hyphae.

Fig. 31. Section through upper surface of pileus of *Polyporus benzoinus*, showing encrusted surface.

Fig. 32. Section through the crust of *Polyporus benzoinus*, showing the hyphae terminating in enlarged ends forming a palisade like layer and hyphae growing upward and forming a crust above it.

Fig. 33. Section through the crust of *Ganoderma lucidum*, showing the enlarged thick-walled cells forming a palisade layer.

Fig. 34. Section through the pileus of *Polystictus barbatulus*, showing hyphae in loose ends at the surface.

Fig. 35. Section through the growing margin of *Polyporus sulphureus*, showing the downward growing hyphae which form the pore walls.

Fig. 36. *Polyporus betulinus*. Same as Fig. 35.

Fig. 37. *Polyporus chioneus*. Same as Fig. 35.

Fig. 38. Section through the growing margin of *Polyporus fumosus*, showing the layer of thicker tissue from which the hymenophore arises.

Fig. 39. Same as Fig. 38. Later stage.

Fig. 40. Section through a portion of the pileus of *Polyporus brumalis*, showing pores simultaneously developed (× 160).

Fig. 41. Section of *Trametes suaveolens*, showing the uniform tissue in the pileus and hymenophore.

Fig. 42. Section of *Polystictus abietinus*, showing hyphae growing downward into the hymenophore in a direction vertically opposed to those in the pileus.

Fig. 43. *Irpex farinaceus*. Same as Fig. 42.

Fig. 44. *Fomes ohiensis*. Same as Fig. 42.

Fig. 45. *Polyporus berkleyi*. Same as Fig. 42.

Fig. 46. Section of *Polystictus obesus*, showing hyphae in parallel strands in the trama and intricately interwoven in the hymenophore.

Fig. 47. *Cyclomyces greenii*. Same as Fig. 46.

Fig. 48. Section of *Polyporus sulphureus*, showing hyphae more condensed in the hymenophore.

Fig. 49. *Polyporus unicolor*. Same as Fig. 48.

Fig. 50. *Polyporus chioneus*. Same as Fig. 48.

Fig. 51. *Fomes fomentarius*. Same as Fig. 48.

Fig. 52. *Polyporus ovinus*. Same as Fig. 48.

Fig. 53. *Polyporus texensis*. Same as Fig. 48.

Fig. 54. *Polyporus nidulans*. Same as Fig. 48.

Fig. 55. Section of portion of hymenophore of *Polyporus sulphureus*, showing basidia arising directly from the trama hyphae.

Fig. 56. *Polystictus perennis*. Same as Fig. 55.

Fig. 57. Section of a portion of hymenophore of *Polyporus frondosus*, showing the development of a slight sub-hymenial layer.
Fig. 58. Section of a portion of the hymenophore of *Polyporus alboluteus* showing a considerable sub-hymenial layer.
Fig. 59. Section of *Polyporus adustus*, showing the layer of dense tissue above the hymenophore.
Fig. 59a. Same. Section through young pileus.
Fig. 60. *Polyporus fumosus*. Same as Fig. 59.
Fig. 61. Section of *Polyporus betulinus*, showing the line of cleavage in the tissue of the pileus along which the hymenophore separates.
Fig. 62. Section of *Gloeoporus conchoides* showing very loose tissue above the hymenophore from which it arises.
Fig. 63. Section of *Gloeoporus conchoides*, showing trama of the pores filled in with a gelatinous substance.
Fig. 64. Hymenial surface of *Trametes hydnoides*, showing round pores. Natural size.
Fig. 65. *Fomes fomentarius*, Same as Fig. 64. Natural size.
Fig. 66. Hymenial surface of *Favolus cucullatus*, showing angled pores. Mag. $\times$ 2.
Fig. 67. Hymenial surface of *Favolus alveolaris*, showing angled and radially elongated pores. Natural size.
Fig. 68. Hymenial surface of *Daedalea quercina*, showing labyrinthiform pores. Slightly reduced.
Fig. 69. Hymenial surface of *Lenzites palisoti (Daedalea amanitoides)*, showing labyrinthiform pores and lamellae. Natural size.
Fig. 70. Hymenial surface of *Lenzites betulina*, showing lamellae. Natural size.
Fig. 71. Hymenial surface of *Lenzites vialis (Daedalea trabea)*, showing lamellae and pores. Natural size.
Fig. 72. Hymenial surface of *Daedalea confragosa*, showing round to labyrinthiform pores. Natural size.
Fig. 72a. Same showing lamellate hymenial surface. Natural size.
Fig. 73. Hymenial surface of *Polystictus prolificans* showing pores at the margin of the pileus, the walls of which soon become lacerated into teeth-like processes. Natural size.
Fig. 74. Hymenial surface of *Irpex sinuosus*. Same as Fig. 73. Natural size.
Fig. 75. Cystidia of *Polyporus gilvus*. 75a. Cystidia of *Trametes pini*. 75b. Cystidia of *Polyporus circinatus*.
Fig. 76a. Cystidia of *Fomes graveolens* embedded in the tissue of the pileus. 76. Single cystidium.
Fig. 77. Hymenial surface of *Cyclomyces greenii (=Polystictus greenii)* showing concentric lamellae. Reduced size.

Novae fungorum species — X[1]).

Autoribus H. et P. Sydow.

Graphiola cylindrospora Syd. nov. spec.

Peridiis amphigenis, sparsis vel in greges rotundatos laxe aut circinatim dispositis, maculis flavidis insidentibus, erumpenti-superficialibus, nigris, hemisphaericis, $^1/_4$—$^3/_4$ mm diam, diu clausis, tandem umbilicatis; filamentis sterilibus ca. $1^1/_2$—2 μ latis, fertilibus $2^1/_2$—$3^1/_2$ μ latis; sporis cylindraceis, rectis vel lenissime inaequilateris, utrinque obtusis vel obtuse attenuatis, continuis, hyalinis, saepe 2-guttulatis, 11—12 ⩻ 1,3—2 μ.

Hab. in foliis Livistonae spec., Mt. Makiling pr. Los Banos ins. Philippinensium, 22. 9. 1912, leg. C. F. Baker no. 84.

Habituell gleicht die Art am meisten der *Graphiola Borassi* Syd. et Butl. Sie unterscheidet sich von allen Arten der Gattung weit durch die lang cylindrischen Sporen.

Meliola pulcherrima Syd. nov. spec.

Hypophylla, aterrima, crassa, densissima, velutina, primitus maculas orbiculares 3—10 mm diam. dein confluendo irregulares et majores efformans, fere omnino ex setis mycelicis densissime stipatis constans; mycelio parco, rudimentari, ex hyphis fusco-brunneis 7—9 μ crassis ramosis remote septatis longitudinaliter conjunctis vel anastomosantibus composito, hyphopodiis nullis; setis mycelicis innumeris, erectis, rigidis, 350—425 μ longis, basi 7—9 μ crassis, remote septatis, atris, opacis, superne bi-trifidis et dilutioribus, quoque ramo ramulos 2 vel 3 plerumque longissimos emittente, ramis ramulisque plus minus late patentibus et saepe etiam recurvatis, apicibus ramulorum dilutis saepe subhyalinis obtusis saepeque etiam leniter dilatatis; peritheciis paucis inter setas absconditis, vix visibilibus, globosis, atris, 175—350 μ diam., contextu opaco, basi hyphis plerumque simplicibus usque 130 μ longis cinctis; asçis ovato-oblongis usque crasse clavatis, 55—100 ⩻ 30—40 μ, 6-sporis; sporidiis tristichis, oblongis, 3-septatis, non vel vix constrictis, utrinque late rotundatis, brunneis, 48—58 ⩻ 12—16 μ.

Hab. in foliis vivis Fici benjaminae. Antipolo, prov. Rizal, Luzon, ins. Philippin., 10. 1912, leg. M. Ramos (E. D. Merrill no. S. 121).

---

[1]) Cfr. Annal. Mycol. XI, p. 54.

Eine prächtige Art, die dicke, schwarze, sammetige Polster bildet. Dieselben bestehen fast nur aus Borsten. In der Beschaffenheit der Borsten erinnert die Art an *Meliola cladotricha* Lév. Die Borsten teilen

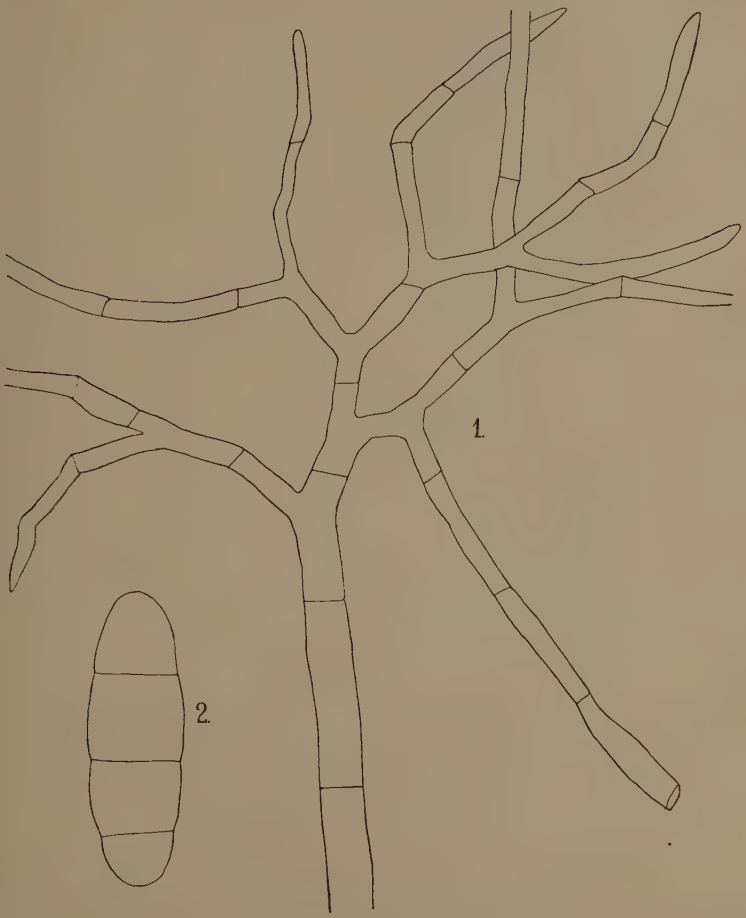

Fig. I. *Meliola pulcherrima* Syd.
1. Myzelborste. Vergr. 250 : 1. 2. Askospore. Vergr. 800 : 1.

sich oben in 2—3 lange Hauptäste, die meist weit abstehen oder auch zurückgebogen sind. Die Hauptäste teilen sich wiederum jeder in 2—3 Nebenäste, die eine bedeutende Länge erreichen können. Die Borsten sind zu drei Viertel ihrer Länge schwarz, undurchsichtig, im

oberen Viertel bedeutend heller gefärbt, die Spitzen der Ästchen oft fast hyalin, oben stumpf oder nicht selten sogar knopfförmig verdickt. Das rudimentäre Myzel scheint keine Hyphopodien auszubilden, wenigstens

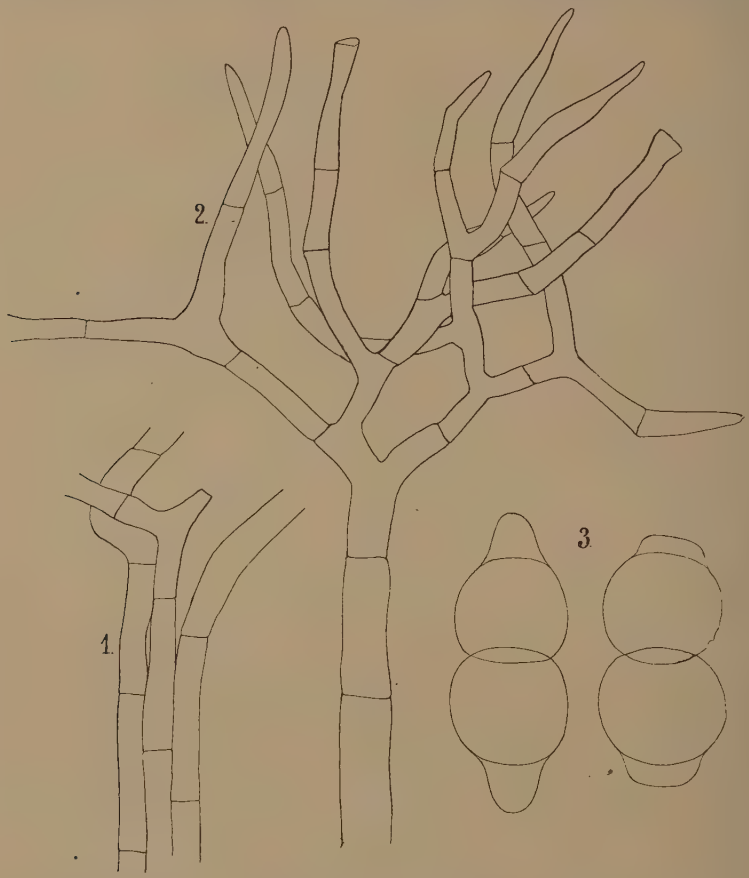

Fig. II. *Meliola arborescens* Syd.
1. Myzelhyphen. Vergr. 250 : 1. 2. Myzelborste. Vergr. 250 : 1. 3. Askospore. Vergr. 800 : 1.

gelang es nicht, solche zu beobachten. Die Schläuche sind anscheinend durchweg 6-sporig, die Sporen nur mit drei Querwänden versehen.

Meliola arborescens Syd. nov. spec.

Plagulas atras orbiculares vel irregulares hypophyllas $^1/_2$—$1^1/_4$ cm longas aterrimas velutinas efformans; mycelio ex hyphis longis non vel parce ramosis pluribus lateraliter connexis brunneis sed pellucidis remote

septatis (articulis 20—40 µ longis) 7—8 µ crassis hyphopodiis destitutis composito; setis mycelicis numerosissimis, erectis, rigidis, 300—420 µ longis, 8—10 µ crassis, opacis, in parte superiore in 2—3 ramos primarios suberectos vel saepius repandos vel recurvatos divisis; ramis his in ramos secundarios iterum divisis; ramis secundariis sese divisis et ramulos ultimos erectos vel repandos longiusculos 35—70 µ longos $3^1/_2$—6 µ latos apice leniter attenuatos vel obtusos pellucide brunneolos usque subhyalinos gerentibus; peritheciis raris intra setas absconditis, magnis, 300—400 µ diam., aterrimis, globosis, contextu opaco; ascis ovato-ellipsoideis, 1—2-sporis, fugacibus; sporidiis oblongis, 3-septatis, ad septa valde constrictis, utrinque rotundatis, obscure castaneo-brunneis, 42—60 × 16—22 µ, loculis duobus extimis multo minoribus globulosis vel hemisphaericis 10—12 µ altis, duobus centralibus majoribus 17—22 µ longis et latis.

Hab. in foliis Eugeniae spec., Todaya ins. Philippinensium, 8. 1909, leg. A. D. E. Elmer no. 11328.

Meliola arborescens ist in mehrfacher Hinsicht eine der interessantesten Arten der Gattung. Der Pilz gehört zu den wenigen Arten mit nur 3 mal septierten Sporen. Die beiden Innenzellen sind um vieles voluminöser als die beiden fast anhängselartigen Endzellen. Die Myzelborsten sind im oberen Teile äußerst stark baumartig verzweigt und sind fast genau so beschaffen wie diejenigen der *M. pulcherrima* Syd. Die großen Perithezien sind schwer wahrnehmbar, da sie in dem dichten von den Borsten gebildeten Filze verborgen sind. Das Myzel besteht aus langen, durchsichtigen Hyphen, die auf lange Strecken seitlich miteinander fest verwachsen sind. Hyphopodien werden auffälligerweise nicht gebildet.

Aithaloderma Syd. nov. gen. Capnodiacearum (Etym. aithalos et derma cutis).

Mycelium superficiale, crustaceum, facile secedens, atrum, conidia triposporioidea generans. Pycnidia biformia, alia conica vel conico-globosa, alia lageniformia. Pycnidiosporae continuae, minutae, hyalinae. Perithecia conica vel conico-globulosa, minuta, atra, ostiolo plano praedita, contextu parenchymatico, tenaci, coriaceo, superne setis crassis obsita; asci crasse clavati, octospori, aparaphysati. Sporidia transverse pluriseptata, hyalina.

Aithaloderma clavatisporum Syd. nov. spec.

Longe lateque effusum, epiphyllum, superficiale, tenuissime pelliculosum, facile secedens, totam folii superficiens obtegens, atrum vel atro-olivaceum, opacum; mycelio rete densissimum efformante, ex hyphis anastomosantibus plerumque longitudinaliter connatis crassioribus 4—6 µ crassis et obscure olivaceis vel brunneis tenuioribus 3—4 µ crassis et plerumque dilutioribus flavis usque flavo-brunneis crebre septatis (articulis 5—10 µ longis) composito, hinc inde conidia triposporioidea plerumque 3-radiata (radiis 28—40 µ longis et 2-septatis) olivaceo-brunnea generante, hyphis paucis

etiam in articulos 13—16 μ longos oidiiformiter secedentibus; pycnidiis biformibus, aliis elongato-lageniformibus, 120—400 μ longis, 15—20 μ crassis, erectis vel parum curvatis, inferne atris opacis, superne saepe dilutioribus et pellucidis, plerumque ad apicem (subinde etiam in medio) abrupte inflatis ibique 25—40 μ crassis; aliis breviter conoideis, 60—90 μ diam., olivaceo-brunneolis, contextu tenaci parenchymatico, superne indistincte ostiolatis; sporulis breviter cylindraceis, continuis, hyalinis, utrinque minute 1-guttulatis, $3^1/_2$—5 ⩒ $1^1/_2$—2 μ; peritheciis aequaliter sparsis, breviter conoideis, 60—90 μ diam., atris, tenacibus, coriaceis, distincte ostiolatis, parte superiore (praecipue circa ostiolum) setis paucis vel compluribus crassis atris 10—20 μ longis $3^1/_2$—5 μ latis subinde elongatis opacis continuis obsitis, contextu parenchymatico, olivaceo-brunneo, ex cellulis 6—8 μ diam. formato; ascis subclavatis vel subsaccatis, apice obtusis et incrassatis, basi brevissime stipitatis, 30—36 ⩒ 14—20 μ, octosporis, aparaphysatis; sporidiis 3—4-stichis vel conglobatis, clavatis, e basi ad apicem sensim latioribus, 3—4-septatis, subinde etiam 5-septatis, ad septa non constrictis, hyalinis 24—26 ⩒ 5—6 μ.

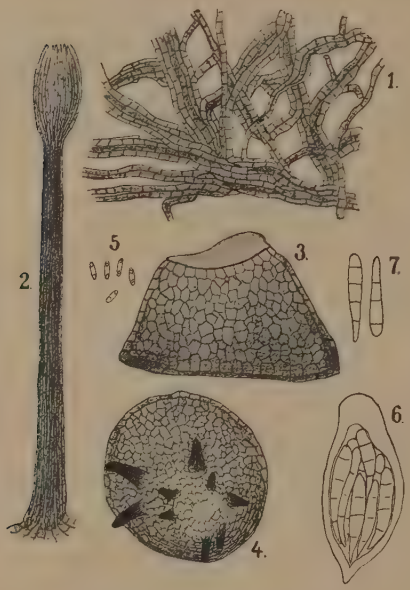

Fig. III. *Aithaloderma clavatisporum* Syd.
1. Hyphengeflecht des Pilzes. Vergr. 280 : 1.
2. Eine längliche Pyknide. Vergr. 280 : 1.
3. Eine rundliche, eigentlich mehr kegelförmige Pyknide von der Seite gesehen. Vergr. 280 : 1.
4. Ein Perithezium von oben gesehen. Vergr. 280 : 1.
5. Pyknosporen. Vergr. 480 : 1.
6. Askus. Vergr. 480 : 1.
7. Askosporen. Vergr. 480 : 1.

Hab. in foliis vivis Voacangae globosae, Los Banos ins. Philippinensium, 1. 2. 1913, leg. C. F. Baker no. 795.

Das sehr leicht ablösbare Myzel überzieht die ganze Oberfläche der Blätter mit einer sehr zarten, ununterbrochenen, matt schwarzen Haut. Es besteht aus der Länge nach verwachsenen derben Hyphen, zwischen denen zartere Hyphen eingeschaltet sind. Hier und da schnürt das Myzel *Triposporium*-artige Konidien ab, manche Hyphen zerfallen auch oidienartig. Besonders reichlich werden kurz kegelförmige, daneben lang flaschenförmige Pykniden gebildet; beide Pyknidenformen enthalten die gleichen Sporen. Die Perithezien sind kurz kegelförmig, von zäher, derb häutig-lederiger Konsistenz, mit flachem Ostiolum. Im oberen Teile sind

die Perithezien mit gewöhnlich 5—10 tiefschwarzen, kurzen und breiten Borsten besetzt.

Eutypella Ruborum Syd. nov. spec.

Stromatibus sparsis vel subinde laxe aggregatis, $^3/_4$—$1^1/_4$ mm diam. et altis, per corticem erumpentibus et hemisphaerice prominentibus, tandem fere superficialibus, atris, partibus matricis leniter nigrificatis insidentibus, rugulosis; peritheciis in quoque acervulo plus minus numerosis, plerumque 5—12, omnino immersis, ostiolis brevissimis tantum plerumque 4-sulcatis prominentibus; ascis elongato-clavatis, longissime stipitatis, p. sp. 30—40 × 7—10 μ, octosporis; sporidiis subdistichis vel congestis, allantoideis, curvulis, in cumulo flavo-brunneolis, singulis pallide lutescentibus, 10—14 × 3 μ.

Hab. in ramis emortuis Rubi spec., Kawauye-mura, prov. Mino Japoniae, 10. 1912, leg. K. Hara no. 138.

Eutypella Wistariae Syd. nov. spec.

Stromatibus sparsis, saepe etiam ramos aequaliter densiuscule obtegentibus, subsphaeroideis, 1—2 mm diam., ligno adnatis et cortice tectis, ostiolis crassis, per peridermium arcte adhaerens erumpentibus, nigris; peritheciis in quoque acervulo copiosis (8—15), dense stipatis, globulosis, collis pro situ plus minusve elongatis; ostiolis crassis, 3—4-sulcatis; ascis oblongo-clavatis, longe pedicellatis, p. sp. 30—40 × 4—$6^1/_2$ μ, octosporis; sporidiis distichis, allantoideis, leniter curvulis, hyalinis vel dilute lutescentibus, 7—11 × 2—3 μ.

Hab. in ramis emortuis Wistariae chinensis, Kawauye-mura, prov. Mino Japoniae, 10. 1912, leg. K. Hara no. 45.

Peroneutypella japonica Syd. nov. spec.

Stromatibus sub peridermio nidulantibus, atris, sparsis, rotundatis vel oblongis, pulvinatis, carbonaceis, 1—3 mm longis, 1—2 mm latis; peritheciis 2—3-stichis, globosis, numerosis in quoque acervulo 15—50 vel ultra, 0,15—0,2 mm diam.; ostiolis cylindraceis, glabris, rectis, usque 1 mm longis; ascis clavatis, p. sp. 20 × 4—$4^1/_2$ μ, octosporis; sporidiis allantoideis, hyalinis, 4—5 × 1 μ; paraphysibus nullis.

Hab. in ramis Rhois spec., Kawauye-mura, prov. Mino Japoniae, 12. 1912, leg. K. Hara no. 74.

Physalospora Hoyae Syd. nov. spec.

Peritheciis amphigenis, plerumque hypophyllis, in partibus foliorum albide decoloratis effusis dense aequaliterque distributis, subinde totam folii superficiem obtegentibus, applanato-globulosis, 150—180 μ diam., atris, poro pertusis, irregulariter parenchymatice fusce contextis, cellulis contextus 9—12 μ diam.; ascis oblongis, subclavatis vel saccatis, apice rotundatis, aparaphysatis (ut videtur), 48—68 × 16—25 μ, octosporis; sporidiis oblongis, utrinque late rotundatis, continuis, hyalinis, 16—25 × $6^1/_2$—8 μ, medio subinde leniter contractis.

Hab. in foliis morientibus Hoyae spec., Los Banos ins. Philippinensium, 15. 2. 1913, leg. C. F. Baker no. 836 ex p.

Physalospora Juglandis Syd. et Hara nov. spec.

Peritheciis dense gregariis, peridermio tectis, globosis, brevissime papillatis, 140—170 μ diam., atris, nucleo albo farctis; ascis clavatis, apice rotundatis, crasse tunicatis, breviter stipitatis, 80—100 ⩻ 16—22 μ, 8-sporis; sporidiis distichis, ovoideo-oblongis vel oblongo-fusoideis, continuis, intus guttulatis, hyalinis, 17—26 ⩻ 7—8 μ.

Hab. in ramis corticatis Juglandis regiae var. sinensis, Kawauye-mura, prov. Mino Japoniae, 2. 1912, leg. K. Hara no. 102.

Didymosphaeria striatospora Syd. nov. spec.

Peritheciis solitariis vel binis consociatis, innatis, epidermide conspicue et nitide atrata tectis, maculas atras $1/2$—$2^1/_2$ mm longas efficientibus, globulosis, 0,12—0,2 mm latis, ostiolo papilliformi; ascis cylindraceis, apice obtusis, sessilibus, 110—140 ⩻ 11—14 μ, octosporis; paraphysibus non visis; sporidiis monostichis, oblongo-ellipsoideis vel oblongis, utrinque obtusis, medio 1-septatis et constrictis, brunneis, quaque cellula saepe grosse 2-guttata, distinctissime striatis, 20—25 ⩻ $6^1/_2$—8 μ.

Hab. in vaginis caulibusque Miscanthi sinensis, Kawauye-mura, prov. Mino Japoniae, 4. 1912, leg. K. Hara no. 73.

Astrosphaeriella Syd. nov. gen. (Etym. ab *Astrosphaeria*, cui affine genus). — Perithecia primitus innata et papilla tantum per epidermidem prorumpentia, subcarbonacea, mox omnino per epidermidem radiatim in lacinias acutas fissam prorumpentia et fere superficialia, conica, atra, glabra. Asci cylindracei, paraphysati, octospori. Sporidia fusoidea, medio 1-septata, colorata.

Astrosphaeriella fusispora Syd. nov. spec.

Peritheciis sparsis, primitus epidermide atrata tectis, mox erumpentibus et basi insculpta applanata subsuperficialibus, sed lacinulis matricis cinctis, eximie tornato-conoideis, glabris, levibus, atris, 0,7—1 mm latis et altis, carbonaceis, papilla nitidula praeditis; ascis cylindraceis, apice obtusis, 75—115 ⩻ 15—18 μ, octosporis; paraphysibus numerosis, filiformibus, ascos superantibus, 1 μ crassis; sporidiis distichis, fusoideis, utrinque attenuatis, medio 1-septatis et constrictis, pluriguttulatis, 38—48 ⩻ 6—8 μ, dilutissime fuscidulis.

Hab. in culmis emortuis Phyllostachydis bambusoidis, Kawauye-mura, prov. Mino Japoniae, 24. 9. 1912, leg. K. Hara no. 67.

Die neue Gattung verhält sich zu *Didymosphaeria* wie *Astrosphaeria* zu *Leptosphaeria* oder *Astrocystis* zu *Anthostomella*. Wie dies Höhnel für die von ihm untersuchten *Melanomma Trochus* und *Astrocystis miralibis* (cfr. Fragmente z. Mykol. no. 225) genauer beschrieben hat, besitzt auch unser Pilz in ganz analoger Weise anfänglich von der geschwärzten Epidermis bedeckte, weich kohlige Perithezien, welche bald die Epidermis radial

sprengen und zu ziemlich großen, schön konischen, bis 1 mm breiten und hohen Fruchtkörpern hervorwachsen. In diesem Zustande hat der Pilz nicht die geringste Ähnlichkeit mehr mit einer *Didymosphaeria*, wozu ihn Höhnel seiner Anschauung nach rechnen würde. Wir sind im Gegensatz zu Höhnel der Meinung, daß es wohl berechtigt ist, die in Rede stehenden

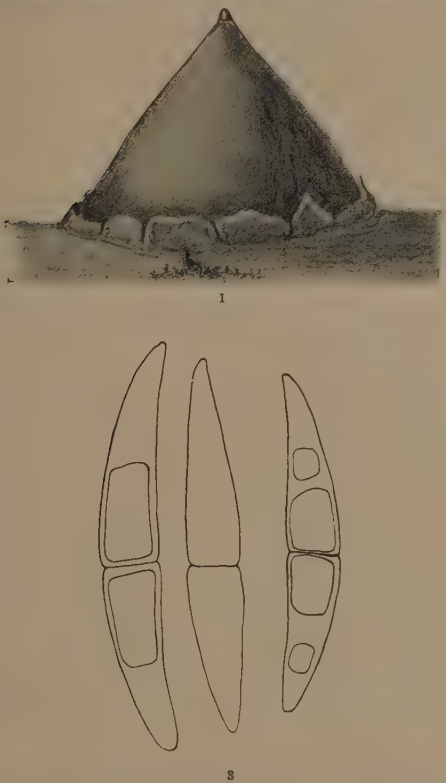

Fig. IV. *Astrosphaeriella fusispora* Syd.
1. Ein ausgewachsenes Perithezium. Vergr. 40 : 1. 2. Askus mit Paraphysen. Vergr. 950 : 1.
3. Sporen. Vergr. 1150 : 1.

drei Pilze infolge ihrer eigenartigen Wachstumsweise nicht nur als Vertreter besonderer Sektionen, sondern besonderer Gattungen anzuerkennen. Wir stellen daher die Höhnel'sche Untergattung *Astrosphaeria* ebenfalls als eigene Gattung auf.

Neopeckia japonica Syd. et Hara nov. spec.

Peritheciis sparsis vel paucis aggregatis, superficialibus, quoad formam variabilibus, junioribus latioribus et humilioribus, senioribus globulosis

vel late conico-globosis, 400—850 μ diam., atris, in mycelio parce evoluto ex hyphis fuscis formato mox evanescente insidentibus, ubique, summo apice tantum excepto, pilis numerosis flexuosis vel rigidulis castaneo-brunneis obtusis 100—300 μ longis, 7—9 μ latis, 4—10-septatis, vestitis, apice truncatis, ostiolo punctiformi, contextu opaco; ascis clavato-cylindraceis, apice obtusis, deorsum sensim in stipitem attenuatis, 90—120 ⩻ 9—11 μ, octosporis, filiformiter paraphysatis; sporidiis oblique monostichis usque subdistichis, fusoideis, 1-septatis, primitus et diu hyalinis valde constrictis utrinque attenuatis, postremo fuscidulis vix constrictis apicibus obtusis, 17—20 ⩻ 4½—6 μ.

Hab. in culmis emortuis Sasae paniculatae, Kawauye-mura, prov. Mino Japoniae, 13. 1. 1913, leg. K. Hara no. 99.

Sphaerulina salicina Syd. nov. spec.

Peritheciis nunc sparsis, nunc plus minusve aggregatis, minutis, ca. 150—225 μ diam., sub epidermide tumidula corticis nidulantibus, globosis, e mutua pressione subinde angulatis, atris, nucleo griseo; ascis fasciculatis, subsessilibus, cylindraceis, 110—140 ⩻ 9—10 μ, octosporis, paraphysibus plane destitutis; sporidiis recte monostichis, ellipsoideo-oblongis vel oblongis, utrinque late rotundatis, primitus 1-septatis, dein semper 3-septatis, ad septum medium plerumque leniter contractis, hyalinis, 15—18 ⩻ 5½—7½ μ, hyalinis.

Hab. in ramis siccis Salicis longifoliae, prope Kulm, North Dakota Americae bor., 16. 2. 1903, leg. J. F. Brenckle, in consortio *Corynei salicini* (Cda.) Sacc.

Der Pilz ist zweifellos mit *Metasphaeria corticola* (Fuck.) Sacc. = *Pleosphaerulina corticola* Rehm in Annal. Mycol. X, 1912, p. 539 verwandt. Er besitzt wie diese Art charakteristisch zylindrische Schläuche mit stets gerade einreihig angeordneten Sporen. Paraphysen fehlen vollkommen. Die Sporen sind aber anfänglich nur in der Mitte septiert, später 3-fach quer septiert. Noch mehr geteilte oder gar längsgeteilte Sporen konnten wir jedoch nicht beobachten. Demnach muß der Pilz zu *Sphaerulina* gestellt werden. Er ist fast stets mit einem *Coryneum* vergesellschaftet, das anscheinend mit *C. salicinum* (Cda.) Sacc. identisch ist.

Nematostigma Syd. nov. gen. Sphaeriacearum (Etym. *nema* filum vel hypha et *stigma* punctum, ob perithecia minuta pilosa). — Perithecia superficialia, subiculo insidentia, globosa, ostiolo obsoleto vel vix prominulo praedita, parenchymatice contexta, molliuscula, extus hyphis vel setulis haud rigidis obsita. Asci saccati, 8-spori. Paraphyses evolutae, sed mox mucosae. Sporidia elongato-fusoidea, transverse pluriseptata, diu hyalina, tandem dilute colorata.

Nematostigma obducens Syd. nov. spec.

Hypophyllum, in mycelio ascomycetis alicujus indeterminati parasiticum, caespites rotundatos 1—3 mm latos planos olivaceo-sulviolaceos radiantes efformans; hyphis subhyalinis usque pallide olivaceo-violaceis, septatis,

ramosis $1^1/_2$—$2^1/_2$ μ crassis; peritheciis numerosis, globosis, 140—200 μ diam., atro-violaceis vel atro-brunneolis, ostiolo minuto vix prominulo, extus hyphis paucis vel modice numerosis rectis (sed haud rigidis) vel parum flexuosis apice obtusis usque 110 μ longis 5—9 μ crassis pluries septatis olivaceo-brunneis obsitis, contextu subtenui, molli, obscure olivaceo-brunneo, parenchymatice ex cellulis majusculis 10—16 μ longis composito; ascis plerumque saccatis, subsessilibus, 70—90 ⩒ 24—30 μ, octosporis, filiformiter paraphysatis; paraphysibus mox mucosis; sporidiis parallele positis, elongato-fusiformibus, rectis vel leniter inaequilateris, utrinque leniter attenuatis, sed obtusis, 6—9-septatis, non vel vix constrictis, primitus hyalinis, in maturitate pallide flavo-brunneolis vel olivaceo-brunneolis, 42—55 ⩒ $7^1/_2$—9 μ.

Hab. in foliis Scutiae indicae in mycelio ascomycetis cujusdam indeterminati parasiticum, Port Elizabeth, Cape Province Africae austr., 23. 3. 1911, leg. E. M. Doidge (J. B. Pole Evans no. 1242).

Der Pilz überzieht mit seinen Hyphen vollständig das Myzel eines anderen nicht näher bestimmbaren Ascomyceten mit dicken, hyphodienlosen Hyphen. Die Rasen wachsen deutlich radiär. Die weichen Perithezien mit großzelliger, sehr deutlich parenchymatischer Wand sind außer mit wenigen oder mäßig zahlreichen, meist geraden, abstehenden, aber doch nicht steifen Hyphen besetzt.

Von *Acanthostigma* unterscheidet sich die neue Gattung durch das Subiculum, die weichen Perithezien und die zuletzt hell gefärbten Sporen. *Acanthostigma heterochaetum* Syd. et Butl. dürfte auch der neuen Gattung zuzurechnen sein. *A. violaceum* Rac. ist sicherlich kein *Acanthostigma*, sondern gehört der Beschreibung nach entweder ebenfalls zu *Nematostigma* oder wahrscheinlicher zu *Nematothecium*.

Coccidophthora Syd. nov. gen. Sphaeriacearum.

In coccide parasitica. Stroma superficiale, ex hyphis tenuibus compositum. Perithecia superficialia vel basi tantum in stromate immersa, dense gregaria, globoso-conoidea vel irregularia, atra, carbonacea vel coriaceo-carbonacea, minute papillata. Asci cylindracei vel subclavati, octospori, paraphysati. Sporidia oblonga, pluriseptata, colorata.

Coccidophthora variabilis Syd. nov. spec.

Stromatibus superficiem coccidium fere omnino obtegentibus, atris, forma irregulari, ex hyphis hyalinis usque olivaceo-brunneis tenuibus sursum versus obscurioribus compositis; peritheciis in stromate superficialibus vel basi tantum leniter immersis, quoad formam et magnitudinem variabilibus, subglobosis, conoideis, elongatis vel irregularibus, 150—300 μ altis, 120—200 μ latis, atris, glabris, subcarbonaceis, minutissime papillatis, contextu parietis indistincto; ascis cylindraceo-clavatis, apice obtusis; brevissime stipitatis vel subsessilibus, 80—100 ⩒ 6—9 μ, octosporis; paraphysibus filiformibus, hyalinis, ca. $1^1/_2$ μ latis; sporidiis monostichis usque

distichis oblongis utrinque obtusis, primo 1-septatis, mox 3-septatis, non constrictis, brunneis, 8—11 ⩻ 3—4½ µ.

Hab. parasitica in Coccide quodam ad folia Sasae paniculatae, Kawauye-mura, prov. Mino Japoniae, 15. 5. 1912, leg. K. Hara no. 15.

Der prächtig entwickelte Pilz lebt parasitisch auf Cocciden, deren Oberfläche er völlig mit seinem Stroma überzieht. Dasselbe besteht aus hyalinen bis bräunlich-olivenfarbigen Hyphen, die nach oben immer dunkler und dichter werden. Die ganze Stromaoberfläche ist von verschieden großen und verschiedenen gestalteten Perithezien, die sich sehr deutlich vom Stroma abheben, besetzt. Die Perithezien besitzen eine sehr kleine, oft kaum wahrnehmbare Papille. Ein deutliches Gewebe der Wand ist

1 2

Fig. V. *Coccidophthora variabilis* Syd.
1. Stroma mit Gehäusen. Vergr. 60 : 1. 2. Askus, Paraphysen und Sporen. Vergr. 625 : 1.

nicht zu erkennen. Der Pilz wächst rasenartig und dürfte daher am besten als Cucurbitariacee aufzufassen sein. In einem Pilzrasen fanden wir inmitten der schwarzen Perithezien zinnoberrote, ebenfalls verschieden gestaltete Gehäuse ohne irgendwelche Sporen. Es handelt sich hier zweifellos um unreife, sich später dunkel färbende Gehäuse desselben Pilzes.

Phyllachora atro-maculans Syd. nov. spec.

Stromatibus spermogonicis amphigenis, maculis atrofuscis orbicularibus vel irregularibus ½—1 cm diam. insidentibus, in maculis irregulariter vel circinatim dispositis, in utraque foliorum pagina leniter pominulis, rotundatis, ⅓—¾ mm diam., atris, opacis; loculis paucis (1—4) in quoque stromate, globulosis; sporulis filiformibus, hyalinis, tenuissimis, 18—35 ⩻ 0,5—0,7 µ, irregulariter curvatis; stromatibus peritheciigeris conformibus, sed minus opacis et subinde leniter nitentibus; ascis clavatis, 80—110 ⩻ 12—18 µ, filiformiter paraphysatis, octosporis; sporidiis oblique mono-

stichis usque distichis, ellipsoideis vel oblongis, utrinque obtusis vel parum attenuatis, continuis, intus pluriguttulatis, hyalinis, 15—21 ⩻ 7—8 µ.

Hab. in foliis vivis Anonae spec., San José, Costa-Rica, 3. 1909, leg. A. Tonduz.

Phyllachora schoenicola Syd. nov. spec.

Stromatibus in utraque foliorum pagina conspicuis, sparsis vel paucis aggregatis et confluentibus, 1/2—3 mm longis, 1/2—1 mm latis, modice prominentibus, aterrimis, superficie non rugulosis, minoribus 1-locularibus, majoribus plurilocularibus; loculis majusculis 150—200 µ diam.; ascis cylindraceis vel cylindraceo-clavatis, 75—95 ⩻ 9—14 µ, octosporis; paraphysibus numerosis, guttulatis, ascos superantibus, filiformibus, $1^1/_4$—$1^1/_2$ µ crassis; sporidiis distichis, fusiformibus, utrinque attenuatis, saepe acutis, continuis, hyalinis, 20—25 ⩻ 5—7 µ, plasmate subinde bipartito, tandem spurie septatis (?).

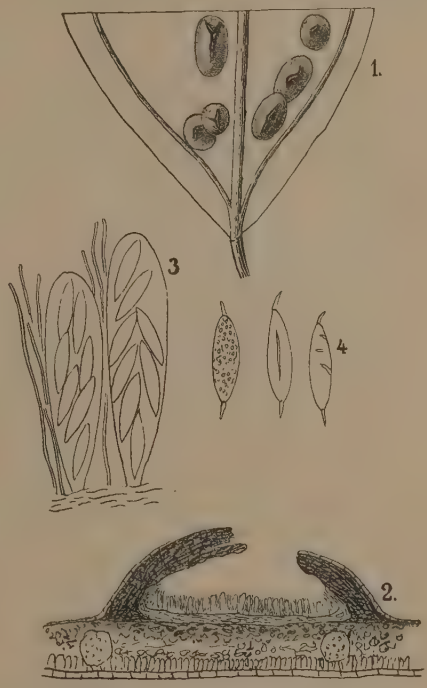

Fig. VI. *Schizochora Elmeri* Syd.
1. Teil eines Blattes mit Stromata. Vergr. 6 : 1.
2. Längsschnitt durch einen Lokulus. Vergr. 60 : 1.
3. Asci mit Paraphysen. Vergr. 370 : 1.
4. Askosporen. Vergr. 625 : 1.

Hab. in foliis vivis Schoeni Apogi, Mt. Banahao ins. Philippinensium, 18. 2. 1913, leg. E. B. Copeland (C. F. Baker no. 853).

Schizochora Syd. nov. gen. Dothideacearum (Etym. schizo findo et achor ulcus). — Stromata in epidermide evoluta, semiglobose prorumpentia, carbonacea, atra, intus paucilocularia, loculis globulosis, rimose dehiscentia. Asci clavati, octospori, paraphysati, paraphysibus tandem mucosis. Sporidia continua, hyalina, utrinque appendiculata.

Schizochora Elmeri Syd. nov. spec.

Stromatibus hypophyllis, in epiphyllo maculas obsoletas atro-fuscas efficientibus, in hypophyllo zona angusta flavidula cinctis, sparsis, hemisphaerico-prominentibus, rotundatis vel ellipticis aut oblongis, subinde etiam angulatis, 1—$1^1/_4$ mm diam,, usque 1 mm altis, atris, opacis, irre-

gulariter rimose dehiscentibus; loculis 1—4 in quoque stromate, 200—300 μ diam.; ascis clavatis, apice rotundatis, sessilibus, 55—75 ⩾ 15—20 μ, octosporis; paraphysibus numerosis, filiformibus, ca. 1 μ crassis, tandem mucosis; sporidiis distichis, oblongo-fusoideis, continuis, utrinque attenuatis, primitus minute granulosis, hyalinis, 17—20 ⩾ 6½—8 μ, utrinque appendicula hyalina tenui 2—4 μ longa praeditis.

Hab. in foliis vivis Fici Guyeri Elm., Dumaguete ins. Philippinensium, 3. 1908, leg. A. D. E. Elmer no. 9462.

Die Stromata befinden sich ausschließlich auf der Blattunterseite. Sie entwickeln sich in der Epidermis, ragen mehr oder weniger halbkugelig hervor und bleiben im unteren Teile von der oberen Hälfte der Epidermis bedeckt. Sie enthalten nur wenige, mitunter nur 1 Lokulus. Die Stromata öffnen sich im oberen Teile rißartig, entweder durch unregelmäßigen, mehr oder weniger stark geschlängelten Längsriß oder durch fast sternartiges Aufreißen. Die Paraphysen verschleimen schließlich. Die einzelligen hyalinen Sporen sind erst feinkörnig, dann stark lichtbrechend und im Innern der Länge nach und auch quer mehr oder weniger zerrissen, so daß solche Sporen oft mehrzellig erscheinen.

Dothidella Picramniae Syd. nov. spec.

Stromatibus in utraque foliorum pagina conspicuis, sparsis, orbicularibus, planis, 1—3 mm diam.; loculis numerosis, minutis, parum prominulis; ascis cylindraceo-clavatis, saepe curvatis, octosporis, 40—55 ⩾ 7—10 μ; sporidiis oblique monostichis usque distichis, fusiformibus, utrinque acutis, medio 1-septatis, non constrictis, hyalinis, 14—16 ⩾ 3½—4½ μ.

Hab. in foliis Picramniae Bonplandianae, San José, Costa-Rica, 10. 11. 1912, leg. Ad. Tonduz.

Von *Dothidella Vismiae* Bomm. et Rouss., unter welchem Namen uns der Pilz zugesandt wurde, unterscheidet sich derselbe durch ganz andere Schläuche und Sporen.

Cyclodothis Syd. nov. gen. Dothideacearum (Etym. *cyclos* circulus et *dothis* pro Dothidea). — Stromata per epidermidem erumpentia, exacte annuliformia, loculos peritheciiformes numerosos continentia, loculis minutis pariete distincto minute celluloso praeditis. Asci clavati, indistincte paraphysati, octospori. Sporidia elongata, oblongo-cylindracea, medio 1-septata, hyalina.

Cyclodothis pulchella Syd. nov. spec.

Stromatibus hypophyllis, in epiphyllo maculas plus minus distinctas decoloratas efficientibus, per epidermidem erumpentibus, exacte annuliformibus, annulum 2—4 mm diam. formantibus, contextu minutissime celluloso, atro-brunneis, ob ostiola prominula minutissime asperatis; loculis numerosissimis, peritheciiformibus, densissime dispositis, globoso-conicis, 65—90 μ diam., pariete distincto minute celluloso obscure brunneo, nucleo albo, ostiolis leniter prominulis; ascis clavatis, subsessilibus 55—70 ⩾

14—18 μ, octosporis, indistincte paraphysatis; sporidiis 3—4-stichis, oblongo-cylindraceis, rectis vel leniter inaequilateris, utrinque obtusis, medio 1-septatis, non constrictis, hyalinis 25—35 ⩻ 4—5 μ.

Hab. in foliis languidis Piperis carylistachyi, Todaya (Mt. Apo), District Davao, Mindanao, 7. 1909, leg. A. D. E. Elmer no. 11163.

Der Pilz ist habituell auffallend, da die Stromata enge Ringe bilden. Die Blattsubstanz ist innerhalb des Ringes unter der Epidermis gebräunt, Das Gewebe des Stromas ist im unteren Teile innerhalb des Blattes faserig, oben kleinzellig. Die Loculi sind perithezienartig mit deutlich

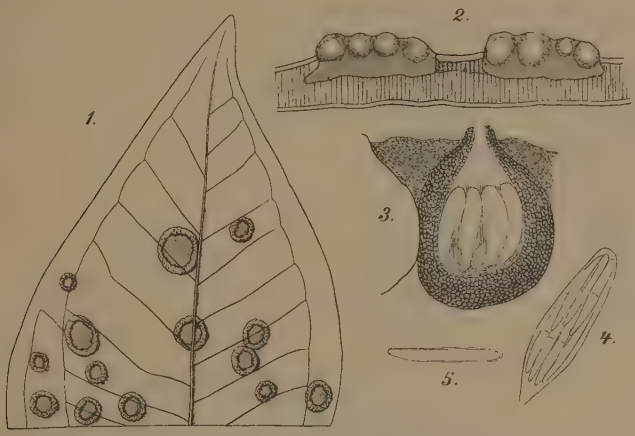

Fig. VII. *Cyclodothis pulchella* Syd.
1. Habitus. Nat. Größe. 2. Querschnitt durch ein Blatt mit Ring. Vergr. 30 : 1.
3. Ein längs durchschnittenes Gehäuse. Vergr. 185 : 1. 4. Askus. Vergr. 310 : 1.
5. Spore. Vergr. 310 : 1.

gegen das Stroma abgesetzter, sehr kleinzelliger, dunkelbrauner Wand. Der Pilz steht *Diplochora* nahe, durchsetzt aber nicht die ganze Blattdicke und bricht nur auf einer Seite hervor.

Dothidea Haraeana Syd. nov. spec.

Stromatibus innato-erumpentibus, rotundatis, pulvinatis, peridermio rupto cinctis, atris, 1/4—3/4 mm diam., superficie ob loculos prominulos rugulosis; loculis 5—20 in quoque stromate; ascis cylindraceis, 70—95 ⩻ 10—12 μ, octosporis; sporidiis monostichis, ellipsoideis vel ellipsoideo-oblongis, utrinque late rotundatis, medio 1-septatis et constrictis, castaneo-brunneis, 14—17 ⩻ 7—8 μ.

Hab. in ramis siccis Lespedezae spec. Kawauye-mura, prov. Mino Japoniae, 1. 1913, leg. K. Hara no. 127.

Dothidea Edgeworthiae Syd. et Hara nov. spec.

Stromatibus erumpentibus, sparsis vel agggregatis, minutissimis, 200—350 μ diam., atris, superficie leniter rugulosis; loculis paucis, 1—5

in quoque stromate; ascis cylindraceis, apice obtusis, deorsum in stipitem longum attenuatis, p. sp. 45—60 ⩽ 12—16 μ, octosporis; paraphysibus numerosissimis ascos superantibus; sporidiis distichis, ellipsoideo-oblongis, utrinque rotundatis, medio 1-septatis et constrictis, fusco-brunneis, 13—16 ⩽ $6^1/_2$—$7^1/_2$ μ.

Hab. in ramis siccis Edgeworthiae Gardneri, Kawauye-mura, prov. Mino Japoniae, 10. 1909, leg. K. Hara no. 122.

Naevia grandis Syd. nov. spec.

Ascomatibus hypophyllis, plerumque seriatim dispositis, primitus clausis, dein epidermidem plerumque in lacinias 4 irregulares disrumpentibus, rotundatis vel ellipticis, $^2/_3$—1 mm longis (raro supra) et latis, disco plano, griseolo, sicco atro; ascis clavatis, 40—50 ⩽ 7—9 μ, octosporis; paraphysibus filiformibus, hyalinis, $1^1/_2$ μ latis, apice non incrassatis; sporidiis oblique distichis, fusoideis, continuis, hyalinis, 10—$11^1/_2$ ⩽ $2^1/_2$—$3^1/_2$ μ, hyalinis.

Hab. in foliis emortuis Caricis spec., Kawauye-mura prov. Mino Japoniae 10. 1912, leg. K. Hara no. 117.

Die bedeutende Größe der Apothezien zeichnen die Art aus.

Zythia fructicola Syd. nov. spec.

Pycnidiis per totam fructuum superficiem fere aequaliter densiusculeque sparsis, singulis etiam in pedunculis evolutis, erumpenti-superficialibus, carnosis, flavo-carneis, globoso-conicis 140—175 μ diam., conico-papillatis, glabris, levibus, contextu indistincte celluloso; basidiis densissime stipatis, brevibus, filiformibus, hyalinis, 5—14 μ longis, ca. $^1/_2$ μ latis; sporulis numerosissimis, ellipticis vel elliptico-oblongis, continuis, hyalinis, utrinque rotundatis vel etiam attenuatis, 2—4-guttulatis, 7—$10^1/_2$ ⩽ 2—$3^1/_2$ μ.

Hab. in fructibus, rarius in pedunculis Stachyuri praecocis, Kawauye-mura, prov. Mino. Japoniae, 10. 1912, leg. K. Hara no. 139.

Diedickea Syd. nov. gen. Pycnothyriacearum (Etym. ab amico nostro et mycologo germanico H. Diedicke, de studio fungorum imperfectorum praecipue merito). — Pycnothyria omnino superficialia, plerumque pluria subiculo membranaceo tenuissimo continuo ex cellulis angustissimis maeandrice curvatis formato conjuncta, radiatim vel fibrillose disposita, minuta, rotundata, contextu radiato, stellatim dehiscentia; sporulae continuae, oblongae, hyalinae, in strato mucoso evolutae; basidia nulla.

Diedickea singularis Syd. nov. spec.

Pycnothyriis hypophyllis, maculis nullis, omnino superficialibus, subiculo tenui membranaceo atro sub microscopio brunneo continuo ex cellulis angustissimis densissime connatis maeandrice curvatis contexto conjunctis, minutis, ambitu rotundatis, 70—100 μ diam., ad marginem planis, centro convexis, plerumque in greges rotundatos vel irregulares 2—8 mm latos radiatim vel circinatim dispositis, rarius irregulariter solitarie ordinatis, atris, contextu radiato, opaco, stellatim dehiscentibus, pariete crassiusculo;

sporulis sub centro pycnothyriorum tantum in massa mucosa hyalina ortis, oblongis vel oblongo-fusoideis, continuis, hyalinis, $10^1/_2$—13 ⩽ 3—$3^1/_2$ μ; basidiis nullis.

Hab. in foliis vivis plantae adhuc indeterminatae, Cabadbaran, Mindanao, ins. Philippin., 9. 1912, leg. A. D. E. Elmer no. 13673.

Der Pilz sitzt auf der Blattunterseite völlig oberflächlich. Er besteht aus schildförmigen, am Rande flachen, in der Mitte erhabenen, opaken Pyknothyrien mit ziemlich dicker Wand. Die einzelnen Gehäuse sind durch ein Subikulum verbunden, das aber geschlossen ist oder besser gesagt, das eine geschlossene Haut darstellt und nicht aus losen Hyphen

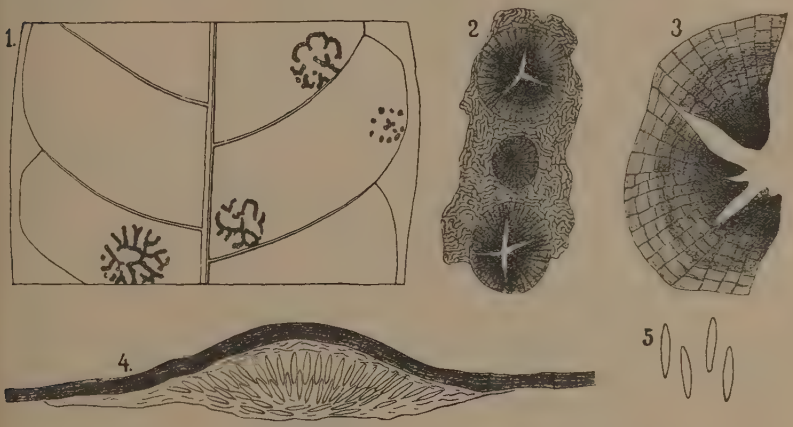

Fig. VIII. *Diedickea singularis* Syd.

1. Habitusbild. Vergr. 1,5 : 1. 2. Ein Stück des Subikulums mit Gehäusen. Vergr. 45 : 1. 3. Stück eines jungen Gehäuses von oben gesehen. Vergr. 280 : 1. 4. Längsschnitt durch ein altes Gehäuse. Vergr. 280 : 1. 5. Sporen. Vergr. 480 : 1.

besteht, sondern aus sehr engen, dicht verwachsenen, mäandrisch gewundenen Zellen zusammengesetzt ist. Unter den etwas hervorragenden Pyknothyrien fehlt dieses Subikulum. Es stellt also nur eine ununterbrochene Verbindung zwischen den Gehäusen dar. Gelegentlich kommen aber auch einzeln stehende Gehäuse vor, die auch am Rande flach, in der Mitte erhaben sind. Die Subikulum-Streifen sind gewöhnlich radiär oder auch kreisförmig angeordnet, fließen oft zusammen und erscheinen alsdann verzweigt. Nur unter dem zentralen Teile der Pyknothyrien befindet sich eine hyaline Schleimschicht, welche ohne Sporenträger die Sporen abschnürt. Auch diese bleiben lange in Schleim gehüllt und bilden eine kompakte Masse, ehe die Gallerte aufgelöst wird.

Der Pilz gehört zweifellos in die Verwandtschaft von *Trichopeltulum* Speg. und *Eriothyrium* Speg., die sich aber nach der Beschreibung habituell,

durch andere Subikulumbildung und durch die anscheinend fehlende Schleimbildung unterscheiden.

Der Pilz wird in Kürze nochmals in den „Leaflets of Philippine Botany" beschrieben und der zurzeit noch unbekannte Name der Nährpflanze bei dieser Gelegenheit veröffentlicht werden.

Gloeosporium Hoyae Syd. nov. spec.

Acervulis hypophyllis, magnam folii partem leniter decoloratam aequaliter denseque obtegentibus, minutissimis, 0,1—0,2 mm diam., primitus dilute succineis, dein obscure succineis, mox cirrhose erumpentibus; basidiis nullis; conidiis oblongis, utrinque rotundatis, continuis, hyalinis, 14—17 ⩽ 4—5 µ.

Hab. in foliis languidis vel morientibus Hoyae spec., Los Banos ins. Philippinensium, 15. 2. 1913, leg. C. F. Baker no. 836 ex p.

Coniosporium extremorum Syd. nov. spec.

Late et dense gregarium, nigrum, tenuiter pulveraceum; caespitulis perexiguis, 50—80 µ diam., punctiformibus, discretis, vix confluentibus; conidiis pro ratione magnis, globosis vel subglobosis, continuis, opace fuscis, levibus, 13—20 µ diam. vel 15—20 ⩽ 12—17 µ.

Hab. in foliis siccis Sacchari officinarum, Los Banos ins. Philippinensium, 1. 3. 1913, leg. C. F. Baker no. 859.

Cercospora Stizolobii Syd. nov. spec.

Maculis amphigenis, orbicularibus, 2—4 mm diam., ochraceo-brunneis, margine elevato atro-fusco cinctis; caespitulis amphigenis, sed plerumque hyphyllis, in centro macularum aggregatis, perexiguis, 50—70 µ diam., atro-olivaceis; hyphis fasciculatis, erectis, simplicibus, vix septatis, 20—38 µ longis, 3½—4 µ crassis, olivaceis; conidiis cylindraceo-subclavatis, utrinque obtusis vel uno fine attenuatis, 3—7-septatis, non vel vix constrictis, pallide olivaceis, 35—60 ⩽ 3½—5 µ.

Hab. in foliis vivis Stizolobii (Mucunae) spec., Los Banos ins. Philippinensium, 6. 4. 1913, leg. M. B. Raimundo (C. F. Baker no. 892).

Von *Cercospora Mucunae* Syd. ist die Art ganz verschieden.

Cercospora subtorulosa Syd. nov. spec.

Maculis amphigenis, distinctissimis, orbicularibus, ½—1 cm diam., ochraceis; caespitulis hypophyllis, totam maculam obtegentibus, sed perexiguis et oculo nudo non visibilibus, olivaceo-brunneis; hyphis fasciculatis, e basi stromatica oriundis, erectis, quoad longitudinem variabilibus, mox brevibus ca. 20—35 µ longis, mox elongatis usque 75 µ longis, 3½—5 µ crassis, rectis vel saepe etiam subtorulosis, simplicibus, continuis usque 1— 4-septatis, olivaceo-brunneis; conidiis anguste obclavatis, 3—7-septatis, non vel leniter constrictis, pallide olivaceis, 35—65 ⩽ 4—5 µ.

Hab. in foliis Allophyli spec., Los Banos Ins. Philippinensium, 7. 4. 1913, leg. C. F. Baker no. 904.

Helminthosporium pulvinatum Syd. et Hara nov. spec.

Caespitulis sparsis, ambitu orbicularibus, crassis, pulvinatis, 1—$1^1/_4$ mm latis, $^1/_4$—$^1/_3$ mm altis, obscure brunneis; hyphis densissime stipatis, erectis, rectis vel leniter flexuosis, simplicibus, copiose septatis, usque 300 µ longis, 7—10 µ crassis, fuscis, articulis 10—25 µ longis; conidiis acrogenis, oblongis vel crasse oblongo-fusiformibus, utrinque obtusis, 6—7-septatis, non constrictis, opace brunneis, loculis extimis plerumque dilutioribus, 34—48 ⩻ 10—12 µ.

Hab. in ramis emortuis Elaeagni glabrae, Kawauye-mura, prov. Mino Japoniae, 5. 1. 1913, leg. K. Hara no. 98.

Die Art ist habituell durch die kissenförmigen, dicken, an ein kleines *Hypoxylon* entfernt erinnernden Rasen sehr ausgezeichnet.

Appendix.

Calopactis singularis Syd.

Von diesem in Annal. Mycol. X, 1912, p. 82 nach spärlichem Materiale beschriebenen Pilze erhielten wir in der Zwischenzeit von Herrn Bethel sehr schönes und reiches Material, dessen Untersuchung die damals mitgeteilten Resultate in allen Punkten bestätigte.

Der Pilz muß zu den Nectrioideen gestellt werden. Er wurde in den Fungi exotici exsiccati sub No. 88 ausgegeben.

Etudes morphologique et biologique d'un Penicillium nouveau, Penicillium Petchii n. sp.

Par A. Sartory et G. Bainier.

(Avec Planche XIV.)

Le *Penicillium Petchii* provient de l'Amérique du Sud. Il a été isolé par M. Petch sur du caoutchouc fraichement coagulé.

Culture en goutte pendante: Morphologie.

Lorsqu'on met une conidie à germer, elle gonfle et double de volume, puis émet deux ou trois filaments qui ne tardent pas à se cloisonner. Ces filaments se ramifient un grand nombre de fois pour former un abondant mycélium étalé d'un beau blanc. Mais très rapidement on constate un changement de couleur accompagnant la production d'une quantité considérable de très longs filaments dressés, serrés les uns contre les autres présentant une belle coloration jaune serin, et formant ainsi un feutrage aérien dont l'épaisseur peut dépasser $^1/_2$ centimètre. Chacun de ces longs filaments prend directement naissance sur une des ramifications du mycélium étalé, puis se dresse verticalement et se termine par un ou plusieurs appareils conidifères.

A mesure que les conidies augmentent en nombre, la culture change de couleur et finit par prendre une coloration d'un vert particulier couleur 367 du C. D. C. Cependant les bords de la culture restent jaunes, de mêmes les régions périthéciennes.

Si on examine un appareil reproducteur on remarque que le support dont la longueur est très variable mais peut atteindre $^1/_2$ centimètre possède une largeur d'environ 5 µ; il donne naissance au même point à son sommet à 4 ou 6 branches de 10 à 12 µ de longueur, surmontées chacune de trois ou quatre stérigmates dont la longueur varie également entre 9 à 12 µ et portant chacun un chapelet de conidies vertes, ovales, assez régulières mesurant pour la plupart 4 µ.

Au bout d'un petit nombre de jours le *Penicillium Petchii* donne des périthèces qui prennent naissance, très rapprochés les uns des autres sur des filaments. Ces périthèces sont d'un beau jaune à la maturité et ont un diamètre un peu variable 150 à 200 µ pour le plus grand nombre. Ils renferment un nombre considérable de thèques sphériques ou légèrement ovales mesurant 12 à 13 µ et contenant chacune 6 ascospores légère-

ment echinulées sur tout leur pourtour. Les dimensions des ascospores = 6 μ environ. On remarque que ces ascospores ne sont pas divisées en deux parties égales par un sillon circulaire qui forme comme un équateur; ce sont des spores non divisées inclus dans un asque. Elles nous rappellent en miniature les spores de truffe. Voir Planche XIV, fig. 10, 11, 12, 13.

L'optimum cultural a été recherché un cultivant ce champignon sur carotte en ayant soin de le faire végéter aux températures suivantes (+ 15°, + 18°, + 22°, + 28°, + 30°, + 34°, + 37°, + 40°).

L'optimum cultural est compris entre + 26 et 28°. Il cesse de végéter à + 39°.

Etude biologique du Penicillium Petchii.

Le *Penicillium Petchii* se trouvait en végétation sur les milieux suivants: Raulin gélatiné, carotte, pomme de terre acide à 2% (d'acide lactique), pomme de terre glycérinée, gélose, albumine d'œuf, banane, décoction de pruneaux gélatiné, sérum, cela pour les milieux solides; sur Raulin normal, neutre, glucosé, Raulin lévulosé, Raulin galactosé, lactosé, glycériné, urée, sur bouillon pepto-glycériné et sur lait pour les milieux liquides. Toutes ces cultures étaient effectuées à + 28°.

Milieux liquides.

Culture sur Raulin normal: Second jour: début de végétation: voile peu épais à la surface en milieu nutritif.

Sixième jour: Les bords de la culture deviennent jaune serin, le pigment produit diffuse légèrement dans le liquide. Les appareils conidiens apparaissent le sixième jour au centre du voile. Les périthèces abondent le douxième jour.

En culture anaérobie on trouve en suspension de petites étoiles blanches mesurant jusqu'à trois et 4 millimètres de diamètre.

A l'examen microscopique le mycélium immergé est très cloisonné, les formes de souffrances sont abondantes, le protoplasme se montre très granuleux, la membrane est épaissie.

Raulin neutre: L'allure des cultures est sensiblement la même que sur Raulin normal.

Raulin glucosé: Identique au Raulin normal.

Raulin lévulosé: Ce milieu est peu recommandable par rapport aux milieux précédents. La poussée est beaucoup plus lente, bien moins abondante et les appareils reproducteurs n'apparaissent en surface que le douxième jour. — Le lévulose n'est pas dédoublé.

Raulin galactosé: Les premières colonies apparaissent le quatrième jour. Elles se présentent sous formes de petits points blanchâtres mesurant environ un demi millimètre.

Le dixième jour les colonies se réunissent et forment à la surface une sorte de voile jaune serin. Les appareils conidiens apparaissent le onzième jour. Les périthèces abondent le quinzième jour.

Raulin urée: Développement très lent. — Petits flocons blancs qui se tiennent en suspension dans le liquide nutritif. Il n'y a aucune odeur ammoniacale. A l'examen microscopique le mycélium immergé est formé d'éléments irrégulièrement cylindriques, très cloisonnés, bourrés de guttules de graisse. — Absence de périthèces.

Raulin maltosé: Le développement est sensiblement le même que sur Raulin glucosé. Abondance de périthèces. — Le maltose n'est pas dédoublé.

Raulin lactosé: Mauvais milieu.

Raulin inuliné 2%. Milieu peu favorable. Le huitième jour apparaissent les premiers appareils conidiens.

Lait: Excellent milieu. — Voile jaune dès le quatrième jour. Appareils reproducteurs nombreux le cinquième jour. Les périthèces sont en très grande quantité à partir du deuxième jour: Le douzième jour coagulation complète de la caséine. Le vingt-huitième jour peptonisation complète de la caséine.

Poids des cultures sur les différents milieux liquides employés au bout de trente jours.

Raulin normal	Raulin neutre	Raulin glucosé	Raulin lévulosé	Raulin galactosé	Raulin maltosé	Raulin urée	Sur de pruneaux	Décoct. de foie	Bouillon pepto-glycériné, glucosé
milligr. 753	milligr. 749	milligr. 788	milligr. 228	milligr. 710	milligr. 741	milligr. 203	milligr. 749	milligr. 280	milligr. 780

Milieux solides.

Pomme de terre: Température de + 28°. Dès le troisième jour mycélium blanchâtre peu épais. — Le cinquième jour apparition des appareils conidiens. Teinte No. 371 puis 366. — Sixième jour couleur No. 366. Dès ce moment présence de périthèces, la couleur jaune serin devient de plus en plus abondante. — Quinzième jour: Les conidies deviennent gris-verdâtre. Couleur des périthèces No. 196, puis le dix-huitième jour No. 186 C. D. C.

Vingt-cinquième jour: Couleur des périthèces No. 188—193. Quant aux appareils conidiens ils sont gris sale.

Pomme de terre glycérinée: La culture est plus lente à débuter, mais plus luxuriante que sur le milieu précédent à partir du sixième jour. Mycélium épais feutré. Les appareils conidiens sont visibles le sixième jour, teinte verdâtre No. 371 puis 341. — Dixième jour les périthèces sont très nombreux et de couleurs variables No. 241, 231, 255 du C. D. C.

Les appareils conidiens sont très nombreux.

Couleur des appareils conidiens à la partie supérieure . 268 C. D. C.
" " " " " " " moyenne . . 258 C. D. C.
" " " " " " " inférieure . 252 C. D. C.

Dix-huitième jour: Le pigment jaune diffuse dans le liquide glycériné.

Pomme de terre acide: Allure générale semblable.

Topinambour: Culture analogue à celle de la pomme de terre simple.

Carotte: Excellent milieu: Dès le deuxième jour végétation abondante. — Troisième jour: Présence d'appareils conidiens couleur No. 371. La couleur des appareils conidiens change très vite et passe successivement aux teintes No. 371, 367, 341 puis 336 du C. D. C. — Les périthèces apparaissent nombreux dès le cinquième jour. Ils sont de couleur jaune au début couleur No. 246, puis jaune sale.

Albumine d'œuf. Milieu médiocre: Présence d'appareils conidiens le dixième jour. Les périthèces sont rares et débutent le quinzième jour. L'albumine n'est pas modifiée après 45 jours.

Raulin normal gélatiné: Le troisième jour présence d'appareils conidiens couleur No. 371. Cinquième jour: Couleur No. 367. — Septième jour couleur No. 362. Début de liquéfaction le douzième jour. Les périthèces sont nombreux et à partie de leur apparition (septième jour) le pigment jaune diffuse dans la gélatine. Le quinzième jour les appareils conidiens deviennent gris sale. — Dix-neuvième jour: Liquéfaction complète.

Gélatine en strie: Même développement.

Gélatine en pipûre: — id.

Gélose: Milieu satisfaisant. — Les appareils reproducteurs (conidiens) sont très nombreux dès le quatrième jour. Les périthèces sont abondants à partir du huitième jour. On ne remarque à aucun moment ni liquéfaction ni dislocation du milieu.

Etude du pigment.

Le pigment jaune du *Penicillium Petchii* est très soluble dans l'alcool à 90°, 80°, 60°, un peu moins soluble dans l'alcool absolu.

Soluble dans la glycérine.

Très soluble dans l'alcool-ether et dans le mélange d'alcool et de glycérine (parties égales).

Très soluble dans l'ether sulfurique.

Insoluble dans l'eau, mais soluble dans l'eau alcalinisée par la potasse ou la sonde.

Très peu soluble dans l'alcool amylique.

Soluble dans la benzine, le xylol, le sulfure de carbone et le chloroforme.

Action des acides sur ce pigment en dissolution alcoolique (alcool à 90°).

Acide azotique: 10 centimètres cubes de dissolution traités par trois gouttes d'acide azotique pur ne provoque aucun changement de la couleur même après une heure d'attente. Après 24 heurs il y a une très légère décoloration.

Si à 10 centimètres cubes on ajoute moitié (5 c^3) d'acide azotique puis subitement son volume (10 c^3) on ne remarque aucune décoloration subie du pigment jaune. Après six à huit minutes la dissolution fonce légèrement, puis au bout d'une heure la dissolution devient jaune foncé (couleur vieux rhum). Aucun précipité ne se forme. Même résultat avec Azo^3 H à l'ébullition. Les acides azotiques dilués au $^1/_3$, au $^1/_{10}$ provoquent un très faible changement de teinte.

Acide sulfurique: Si nous répétons les mêmes expériences pour l'acide sulfurique et les acides sulfuriques dilués, nous obtenons les résultats suivants. Deux gouttes d'acide So^4H^2 pur dans 10 c^3 de dissolution du pigment avive la couleur. Si à 10 c^3 de dissolution on ajoute $^1/_2$ c^3 de So^4H^2 la coloration est encore avivée. Finalement nous obtenons une coloration (vieux rhum).

Acide chlorhydrique: Avec l'acide chlorhydrique la couleur du pigment ne change pas sensiblement. Avec l'acide chlorhydrique à l'ébullition la couleur ne vire pas au début mais au bout de peu de temps elle vire brusquement et prend la teinte vieux rhum.

Acide phosphorique: L'acide phosphorique ne provoque à froid aucune décoloration; il n'avive pas la couleur; à l'ebullition on remarque un faible changement de teinte, puis finalement nous obtenons la teinte vieux-rhum.

Acides organiques.

L'acide acétique cristallisable, les acides oxalique, lactique, citrique, salicylique, phénique ne provoquent aucun changement.

Autres produits: Le permanganate de potasse a peu d'action sur le pigment en solution alcoolique. L'acide sulfurique et le zinc, l'eau de Javel, l'eau oxygénée provoquent la teinte jaune foncé tirant sur la couleur vieux-rhum.

L'examen spectroscopique montre pour le pigment en solution etherée ou alcoolique, une absorption de la région droite à partir de la raie D. Nous n'avons jamais pu obtenir le pigment à l'état cristallisé. L'évaporation dans différentes conditions des solutions du pigment dans alcool, ether chloroforme benzine, sulfure de carbone, ether de pétrole fournissait constamment un residu résineux jaune.

Pathologie expérimentale.

L'infection expérimentale était réalisée en injectant une émulsion de conidies (2 cc^3) contenant environ 12 millions de conidies par c^3 dans la

veine marginale de l'oreille d'un lapin pesant 1 Kgr. 990. L'émulsion était faite dans le sérum physiologique. Résultat négatif.

Mêmes résultats en injection intra péritonéale chez le lapin et le cobaye.

Conclusions.

Le *Penicillium Petchii* végète à peu près sur tous les milieux employés en mycologie, son milieu d'élection est la carotte. Toutefois il pousse très bien sur pomme de terre, pomme de terre glycérinée et pomme de terre acide. Son optimum cultural est compris entre + 26—28°. Il pousse encore à des températures de + 37 et 38°. Il coagule le lait, liquéfie la gélatine, il ne décompose pas l'urée et est sans action sur l'amidon, l'inuline, la dextrine, l'albumine d'œuf. — Il n'est pathogène ni pour le lapin ni pour le cobaye. Il donne des périthèces nombreux. Les ascospores sont echinulées et ont cette particularité curieuse de ne pas être divisées en deux parties égales par un sillon circulaire qui forme comme une équateur. Le *P. Petchii* secrète un pigment jaune.

* * *

Travail des laboratoires de Botanique Cryptogamique de l'Ecole supérieure de Pharmacie de Paris et de Pharmacie chimique de l'Ecole supérieure de Pharmacie de Nancy.

Légende de la planche XIV.

1. Début d'un conidiophore . . . . . gt. = 410 fois.
2. — id. — . . . . . gt. = 410 fois.
3. Autres formes de début . . . . . gt. = 410 fois.
4 et 5. Appareils conidiens définitifs . . . . . gt. = 410 fois.
6, 7, 8. Autres dispositions d'appareils conidiens . . . . gt. = 410 fois.
9. Début de périthèces . . . . . gt. = 740 fois.
10. Asque et ascospores . . . . . gt. = 740 fois.
11. — id. — . . . . . gt. = 740 fois.
12—13. Asques et ascospores avec plus faible grossissement gt. = 410 fois.
14. Coupe dans un de périthèce jeune . . . . . gt. = 740 fois.
15. Tortillons très fréquents au début de la formation des périthèces . . . . . gt. = 410 fois.

Disseccamento dei rametti di Pseudotsuga Douglasii Carr. prodotto da una varietà di Sphaeropsis Ellisii Sacc.

Di L. Petri.

Nella primavera dell'anno scorso (1912) a Grezzano nel Mugello[1], a 350 m. sul livello del mare, si è manifestato il disseccamento dell'estremità dei rametti in molti individui di *Pseudotsuga Douglasii*, coltivati da 5—7 anni sotto alti pini *(Pinus silvestris)*.

I caratteri del disseccamento erano simili a quelli che ho giá descritto altra volta per i rametti di pino[2]), e cioè il disseccamento della porzione apicale si arrestava bruscamente a breve distanza dell'apice, e in corrispondenza del limite fra la parte disseccata e quella ancora verde si riscontrava la presenza di un micelio che aveva invaso i tessuti corticali. Nei campioni raccolti non si notavano traccie di fruttificazioni fungine, solo il soggiorno in camera umida ha determinato sulla superficie dei rametti la formazione di piccoli picnidi neri, isolati, o aggregati in piccoli gruppi o anche in brevi serie longitudinali (fig. 1), dapprima coperti dalla peridermide[3]), di poi erompenti e sollevantisi sulla superficie dei rametti. Il micelio si sviluppa nel parenchima corticale e nei fasci liberiani, si arresta al cilindro legnoso distruggendo la zona cambiale. Nei primi stadi dell'infezione il micelio ha un percorso intercellulare, ma dopo la morte delle cellule diventa intracellulare. Verso la periferia del parenchima corticale le ife s'ingrossano, raggiungendo 6 e anche 8 μ di diametro, la loro parete diventa bruna e il loro contenuto si presenta costituito da abbondanti sostanze grasse. Queste ife non giungono mai a formare un vero stroma, ma solo un lasso intreccio dal quale hanno origine i picnidi. Questi sono visibilmente obpiriformi, provvisti di una parete a struttura pseudoparenchimatica bruno-olivacea e di un ostiolo, nel loro diametro trasverso misurano 120—160 μ. Lo strato sporigeno è costituito da brevi sporofori cilindrici, leggermente ingrossati alla base, i quali danno origine a una sola spora ciascuno. Le picnospore sono unicellulari, irregolarmente ellissoidali, per lo più ingrossate all'estremità

[1]) Si tratta di una piantagione di proprietà del Sig. Edmond Dopples.

[2]) Sul disseccamento degli apici nei rami di pino *(Ann. Myc.*, V, 1907).

[3]) La porzione del rametto dove si formano i picnidi è ancora ricoperta dell'epidermide ma sotto queste già si è differenziata la peridermide (cfr. fig. 2).

apicale, alquanto assottigliate e talvolta nettamente troncate alla base, non raramente sono leggermente curve. Dapprima ialine, diventano ocracee poco prima del loro distacco dai basidi, in seguito, a completo sviluppo, sono fortemente fuliginee, quasi opache. Il loro contenuto è finamente granuloso, sono sempre sprovviste di una o più grosse goccie

Fig. 1.

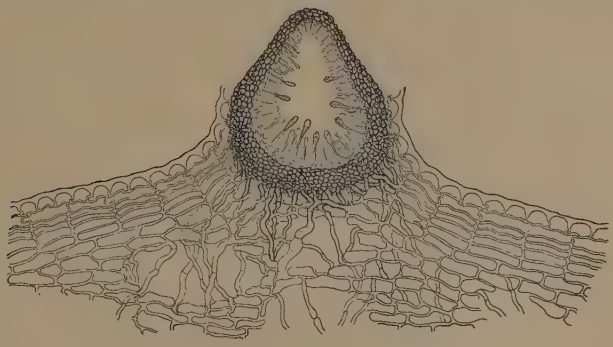

Fig. 2.

di sostanze grasse. L'episporio è completamente liscio. Il loro diametro, trasverso e longitudinale, presenta più frequentemente le seguenti misure: μ 10 ⩽ 33, 12 ⩽ 33, 12,5 ⩽ 34, 12,5 ⩽ 35, 12,5 ⩽ 36, 14 ⩽ 39, 15 ⩽ 34,5.

I caratteri surriferiti fanno ascrivere il fungo in questione al gen. *Sphaeropsis*. Fra le specie di questa sferopsidea che vivono sulle Conifere[1]), la forma ora descritta è riferibile alla *Sphaeropsis Ellisii* Sacc. per i caratteri dei picnidi, nettamente papilliformi, e per le dimensioni delle spore. La breve diagnosi che di questa specie si trova nella Sylloge Fungorum del Saccardo[2]) è la seguente:

Sphaeropsis Ellisii Sacc. *Sph. Pinastri* C. et Ellis in Grevillea. Peritheciis papilliformibus, epidermide cinctis, hinc illinc subgregariis; sporulis elongato-ellipticis, brunneis, 30 ⩽ 12 μ vel 35—40 ⩽ 15.

In ramis corticatis *Pini silvestris*, New Jersey, America borealis.

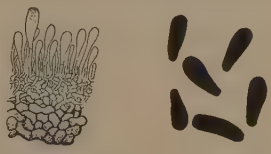

Fig. 3.

Si tratta di una specie assai ricca di forme, distinte fra loro, più che per caratteri morfologici, per la diversitá della pianta ospite. La forma tipica descritta da C. e Ellis non è stata ancora trovata in Italia. Cavara ha pubblicato nei *Fungi Long. Exsiccati* (No. 95) una forma di *Sphaeropsis Ellisii* vivente sui coni di *Pinus silvestris* coltivato

---

[1]) *Sphaeropsis acicola* Pass., *Sph. Juniperi* Peck, *Sph. Ellisii* Sacc., *Sph. Pinastri* (Lév.) Sacc., *Sph. Taxi* (Schw.) Berk.

[2]) Vol. III, pag. 300.

nell'Orto Botanico di Pavia[1]). Le dimensioni e la forma delle spore di questo fungo coincidono quasi perfettamente con quelle descritte da C. e Ellis. Misure da me eseguite su questo materiale hanno dato i seguenti valori per il diametro trasverso e longitudinale: μ 12 ⩽ 30, 13 ⩽ 28,5, 13,5 ⩽ 33, 15 ⩽ 30, 18 ⩽ 34. Il rapporto fra i due diametri nella forma tipica è di 1:2,3—1:2,6, nella forma trovata da Cavara è di 1:1,8—1:2,5. Si tratta di spore più largamente ovali.

Nella *Sphaeropsis* ora descritta tale raporto è di 1:2,3—1:3,3. Cioè in quest'ultima forma le spore sono più strette e si avvicinano di più a quelle della forma tipica e a quelle della *Sph. Ellisii* var. *Abietis* nelle quali il rapporto fra i due diametri è di 1:2,8—1:3.

Nella *Sph. Ellisii* var. *Laricis* Peck il rapporto fra i due diametri è di 1:2—1:2,2, cioè le spore tendono più alla forma ovata, come nell' esemplare raccolto de Cavara. Questa varietà del resto è ben caratterizzata dalle dimensioni relativamente grandi dei picnidi (350 μ di diametro).

La *Sphaeropsis* della *Pseudotsuga* differisce quindi leggermente dalle varietà ora note della *Sphaeropsis Ellisii* per le dimensioni e la forma delle spore. Le maggiori affinità, riguardo a questi caratteri, sono con la var. *Abietis*.

I tentativi fatti per coltivare il fungo su substrati nutritivi artificiali sono completamente falliti, le spore non avendo germinato. Questa mancata germinazione si deve probabilmente alla loro recente formazione, essendo necessario comunemente un periodo di riposo più o meno lungo prima che le spore affiano raggiunto le condizioni interne atte alla produzione del micelio.

La causa principale che ha determinato l'infezione si deve attribuire all'ubicazione particolare delle piante attaccate. Le *Pseudotsuga* dell'età di 5—7 anni, si trovano sotto la chioma di grossi pini *(Pinus silvestris)* in un terreno sabbioso, fresco. Malgrado l'esposizione a Sud, queste piante sono insufficientemente illuminate e si trovano in una atmosfera eccessivamente umida. Alla distanza di 50 metri circa, nello stesso terreno, si trovano, alcune migliaia di *Pseudotsuga* della stessa età, non coperte dal l'ombra di nessun albero. In relazione a queste migliori condizioni d'illuminazione e di aereazione stà l'assoluta mancanza d'infezione di queste piante. Per quanto l'osservazione diretta non sia stata ancora fatta, è però da non escludersi del tutto che l'infezione della *Pseudotsuga* provenga dalle spore di una *Sphaeropsis* vivente sui rametti o sui coni del *Pinus silvestris* e sviluppatasi poi sulle piante sottostanti in seguito alle speciali condizioni di umidità e di temperatura.

Contro questa infezione furono sperimentate con successo le irrorazioni di solfato di rame e calce 1%.

---

[1]) Con ragione Cavara esclude possa trattarsi della *Sphaeropsis Pinastri* (Lév.) Sacc., la quale non ha picnidi papilliformi e le cui spore sono relativamente piccole misurando solo 6—7 ⩽ 10 μ.

Neue Literatur.

Ames, Adeline. A new wood-destroying fungus (Botan. Gazette vol. LV, 1913, p. 397—399, 6 fig.).

Arnaud, G. Sur les genres Zopfia, Richonia et Caryospora (Bull. Soc. Myc. France vol. XXIX, 1913, p. 253—260, 2 fig., tab. XI).

Arnaud, G. Maladie du pêcher et de l'amandier (La Revue de Phytopathologie vol. I, 1913, p. 24—27, 2 fig.).

Bally, W. Die Chytridineen im Lichte der neueren Kernforschung (Mycolog. Centralblatt vol. II, 1913, p. 289—297).

Bezssonoff, N. Notice sur le développement des conidiophores et sur les phénomènes nucléaires qui l'accompagnent chez le „Sphaerotheca Mors uvae" (Schwein.) Berk. et Curt. et le „Microsphaera Astragali" (s. Erysiphe Astr.) D. C. Trev. (Bull. Soc. Myc. France vol. XXIX, 1913, p. 279—291, tab. XIV—XIX).

Bischoff. Über eine Pilzkultur, die sich aus an Ameisen gewachsenen Pilzen entwickelt hatte (Berlin. entom. Zeitschr. vol. LVII, 1912, p. 2).

Blaringhem, L. Observations sur la rouille des guimauves (Puccinia Malvacearum Mont.) (Bull. Soc. bot. France vol. LIX, 1913, p. 765—773).

Blakeslee, A. F. Conjugation in the heterogamic genus Zygorhynchus (Mycolog. Centralblatt vol. II, 1913, p. 241—244, 2 tab.).

Bokorny, Th. Pilzfeindliche Wirkung chemischer Stoffe. Chemische Konservierung (Centralbl. f. Bakt. II. Abt. vol. XXXVII, 1913, p. 168—267).

Breslauer, A. A propos du dimorphisme sexuel des Mucorinées (Bull. Soc. bot. Genève 2. vol. IV, 1912, p. 228—237).

Briosi, G. e Farneti, R. A proposito di una nota del Dott. Lionello Petri sulla Morià dei Castagni (mal dell'inchiostro) (Rendic. R. Accad. Lincei Roma vol. XXII, ser. 5a, 1913, p. 361—366).

Brooks, F. T. and Price, S. R. A disease of tomatoes (New Phytologist vol. XII, 1913, p. 13—21).

Brown, W. H. and Graff, P. W. Factors influence fungus succession on dung cultures (Philippine Journ. Sc. VIII. Sect. C. Bot. 1913, p. 21—29).

Bruck, W. F. Plant diseases translated by J. R. Davis (Blackie & Son Ltd. 1912, 152 pp.).

Capus, J. La prévision des maladies cryptogamiques de la vigne (La Revue de Phytopathologie vol. I, 1913, p. 28—29).

Crossland, C. Recently discovered fungi in Yorkshire (Naturalist 1913, p. 173—179).

Downson, W. J. Über das Mycel des Aecidium leucospermum und der Puccinia fusca (Zeitschr. f. Pflanzenkrankh. vol. XXIII, 1913. p. 129—137, 1 tab.).

Dumée, P. Nouvel atlas des champignons comestibles et vénéneux. 3. éd. Sér. I (Paris, 1913, 8°, 64 tab. col.).

Edgerton, C. W. The stem rot or Hawaiian „iliau" disease of sugar cane (Phythopathology vol. III, 1913, p. 93—98, tab. VIII).

Egeland, J. Meddelelser om norske hymenomyceter (N. Mag. Naturv. vol. LI, 1913, p. 53—93).

Ellis, J. W. Wirral fungi. Part II. Basidiomycetes (concl.) and Aecidiomycetes (Proc. Liverpool Nat. Field Club 1912, p. 27—43).

Embden, A. Das Präparieren von fleischigen Hutpilzen (Verh. Naturw. Ver. Hamburg. Dritte Folge, vol. XIX, 1912, p. 1—14).

Ewert, R. Die Krankheiten der Obstbäume (Berlin, 1913. 8°, 118 pp., 51 fig.).

Fallada, O. Über die im Jahre 1912 beobachteten Schädiger und Krankheiten der Zuckerrübe (Österr.-Ungar. Zeitschr. Zuckerind. u. Landw. vol. XLII, 1913, p. 1—15).

Falck, R. Blossom-infection by smuts and natural distribution of smut diseases. In: O. Brefeld, Investigations in the general of mycology (Philadelphia 1912, 4°, 59 pp., 2 tab.).

Ferdinandsen, C. und Winge, Ö. Plasmodiophora Halophilae sp. n. (Centralbl. f. Bakt. II. Abt. vol. XXXVII, 1913, p. 167, 1 fig.).

Fiori, A. Sopra un caso di vasta carie legnosa prodotta da Rosellinia necatrix Berlese (N. Giorn. bot. Ital. N. S. vol. XX, 1913, p. 40—44, 1 tab.).

Foex, E. Evolution du conidiophore de Sphaerotheca Humuli (Bull. Soc. Myc. France vol. XXIX, 1913, p. 251—252, tab. X).

Fragoso, R. G. Acerca de algunos Ustilagináceos y Uredináceos de la flora española (Bol. Real. Soc. española de Hist. nat. 1913, p. 179—199).

Frouin. Action des sels des terres rares sur le développement du bacille tuberculeux et de l'Aspergillus niger (Compt. Rend. Soc. Biol. Paris vol. LXXIII, 1912, p. 640—641).

Fuhrmann, F. Vorlesungen über technische Mykologie (Jena [G. Fischer] 1913. 8°. VIII et 454 pp., 140 fig.).

Garbowski, L. Keimungsversuche mit Konidien von Phytophthora infestans de Bary (Centralbl. f. Bakt. etc. II. Abt. vol. XXXVI, 1913, p. 500—508, 1 tab.).

Goupil, R. Recherches sur les composés phosphorés formés par l'Amylomyces Rouxii (Compt. Rend. Acad. Sc. Paris vol. CLVI, 1913, p. 959—962).

Gramberg, E. Pilze der Heimat. Eine Auswahl der verbreitetsten eßbaren, ungenießbaren und giftigen Pilze unserer Wälder und Fluren in Wort und Bild. Mit 130 farbigen Pilzgruppen auf 116 Tafeln nach der Natur gemalt von Kunstmaler E. Dörstling. I. Band. Blätterpilze, II. Löcherpilze und kleinere Pilze (Leipzig 1913, Quelle u. Meyer).

Graves, A. H. Notes on diseases of trees in the southern Appalachians. I. (Phytopathology vol. III, 1913, p. 129—139, 10 fig.).

Griffon, Ed. et Maublanc, A. Sur quelques champignons parasites des plantes tropicales (Bull. Soc. Myc. France vol. XXIX, 1913, p. 244—250, 2 fig., tab. IX).

Grove, W. B. The evolution of the higher Uredineae (The New Phytologist vol. XII, 1913, p. 89—106, 2 fig.).

Guilliermond, A. Les progrès de la cytologie des champignons (Progressus rei bot. vol. IV, 1913, p. 389—542, 82 fig.).

Hariot, P. Sur quelques Urédinées (Bull. Soc. Myc. France vol. XXIX, 1913, p. 229—232).

Harper, E. T. The probable identity of Stropharia epimyces (Peck) Atk. with Pilosace algeriensis Fries (Mycologia vol. V, 1913, p. 167—169).

Hedgcock, G. G. Notes on some diseases of trees in our national forests. III. (Phytopathology vol. III, 1913, p. 111—114).

Höhnel, Fr. von. Verzeichnis der von mir gemachten Angaben zur Systematik und Synonymie der Pilze (Österr. bot. Zeitschr. vol. LXIII, 1913, p. 167—171).

Istvánffi, Gy. von. Über die Inkubationsdauer der Plasmopara der Rebe mit Rücksicht auf die Bekämpfung der Blattfallkrankheit (Bot. Közlem. vol. XII, 1913, p. 1—7).

Ito, S. Notes on the species of Puccinia parasitic on the Japanese Ranunculaceae (Collection of Botan. Papers presented to Prof. Dr. Kingo Miyabe on the Occasion of the 25. Anniv. of his Acad. Service by his Friends and Pupils 1913, 14 pp., 2 fig.).

Jannin, L. Les Mycoderma. Leur rôle en pathologie (Thèse, Nancy, 1913, 278 pp., 4 tab.).

Jehle, R. A. The brown rot canker of the peach (Phytopathology vol. III, 1913, p. 105—110, tab. X).

Kern, F. D. The nature and classification of plant rusts (Transact. Amer. Microsc. Soc. vol. XXXII, 1913, p. 41—68).

Köck, Kornauth und Brož, O. Ergebnisse der im Jahre 1912 durchgeführten Versuche und Untersuchungen über die Blattrollkrankheit der Kartoffel (Zeitschr. f. d. landw. Versuchsw. in Österreich 1913, p. 89—140).

Kossowicz, A. Ueber das Verhalten einiger Schimmelpilze zu Kalkstickstoff (Zeitschr. f. Gärungsphysiologie vol. II, 1913, p. 154—157).

Krause, F. Eine Blattfleckenkrankheit am Getreide (Jahrber. Ver. angew. Bot. vol. IX, 1913, p. 103—116).

Kusano, S. A primitive sexuality in the Olpidiaceae (Bot. Mag. Tokyo vol. XXVII, 1913, p. (90)—(93) — Japanisch.

Küster, E. Anleitung zur Kultur der Mikroorganismen. 2. Aufl. Leipzig u. Berlin, B. G. Teubner, 1913. 8°. 218 pp., 25 fig.

Lazaro è Ibiza, B. Notas micologicas, colleccion de data referentes à los hongos de España. (Mem. r. Soc. Española Hist. nat. VII. Mem. 4, 1912, p. 1—55).

Lepierre, Ch. Zinc et Aspergillus niger (2e note) (Bull. Soc. chim. France XIII—XIV, 1913, p. 359—362).

Lepierre, Ch. Remplacement du zinc par l'uranium dans la culture de l'Aspergillus niger (Compt. Rend. Acad. Sc. Paris vol. CLVI, 1913, p. 1179—1181).

Levine, M. Studies in the cytology of the Hymenomycetes, especially the Boleti (Bull. Torr. Bot. Club vol. XL, 1913, p. 137—181, tab. IV—VIII).

Lindau, G. Spalt- und Schleimpilze. Eine Einführung in ihre Kenntnis. (Sammlung Göschen, no. 642. Berlin u. Leipzig, 1912, 16°, 116 pp., 11 fig.).

Lindfors, Th. Bemerkungen über Uromyces ambiguus (DC.) Lév. (Svensk Bot. Tidskr. vol. VII, 1913, no. 1, 2 pp.).

Lindfors, Th. Aufzeichnungen über parasitische Pilze in Lule Lappmark (Svensk Bot. Tidskrift vol. VII, 1913, no. 1, p. 39—57).

Lister, G. Notes on the Mycetozoa of Linnaeus (Journal of Botany vol. LI, 1913, p. 160—164).

Litwinow, N. Über die verschiedene Widerstandsfähigkeit der Formen des Sommergetreides gegen Rost (Bull. angew. Bot. St. Petersburg V, 1912, p. 347—423) — russisch und deutsch.

Lutz, L. Contribution à l'étude de la Flore mycologique souterraine de la région parisienne (Bull. Soc. Myc. France vol. XXIX, 1913, p. 233—238).

Magnus, P. Die Verbreitung der Puccinia Geranii Lév. in geographisch-biologischen Rassen (Ber. Deutsch. bot. Ges. vol. XXXI, 1913, p. 83—88, 1 tab.).

Magnus, P. Zur Kenntnis der parasitischen Pilze Siebenbürgens (Mitteil. Thüring. bot. Ver. N. F. vol. XXX, 1913, p. 44—48).

Magnus, P. Zur Geschichte unserer Kenntnisse des Kronenrostes der Gräser und einige daran sich knüpfende Bemerkungen (Verhandl. Schweiz. naturf. Ges. 95. Jahresvers. Altdorf 1912, II, 1912, p. 220—225).

Marchand, H. Nouveaux cas de conjugaison des ascospores chez les levures (Compt. Rend. Soc. Biol. Paris vol. LXXIII, 1912, p. 608—610).

Martin, C. E. Notes mycologiques. (Bull. Soc. bot. Genève 2. vol. IV, 1912, p. 244—245).

Martin, C. E. Résultats mycologiques de l'herborisation du 5 mai 1912 (l. c., p. 163—164).

Martin, C. E. Les quatres Cordyceps de la flore mycologique Suisse (l. c., p. 375).

Maublanc, A. Ed. Griffon (1869—1912) (Bull. Soc. Myc. France vol. XXIX, 1913, p. 197—205).

Mer, E. Le Lophodermium nervisequum parasite des aiguilles de sapin (Bull. Soc. bot. France vol. LIX, 1913, p. LI—LX).

Mercer, W. B. On the morphology and development of Phoma Richardiae (Mycolog. Centralblatt vol. II, 1913, p. 244—253, 297—305, 6 fig.).

Miyake, J. Studien über chinesische Pilze (Bot. Mag. Tokyo vol. XXVII, 1913, p. 37—44).

Moreau, F. Une nouvelle Mucorinée hétérogame, Zygorhynchus Dangeardi sp. nov. (Bull. Soc. bot. France vol. LIX, 1913, p. LXVII—LXX).

Moreau, F. Les phénomènes morphologiques de la reproduction sexuelle chez le Zygorhynchus Dangeardi Moreau (Bull. Soc. Bot. France vol. LIX, 1913, p. 717—720).

Moreau, F. Sur une nouvelle espèce d'Oedocephalum (Bull. Soc. Myc. France vol. XXIX, 1913, p. 239—241, 1 fig.).

Moreau, F. Le centrosome chez les Urédinées (Bull. Soc. Myc. France. vol. XXIX, 1913, p. 242—243).

Murrill, W. A. Illustrations of Fungi — XIV (Mycologia vol. V, 1913, p. 93—96, tab. LXXXVII).

Naoumoff, N. Matériaux pour la flore mycologique de la Russie (Bull. Soc. Myc. France vol. XXIX, 1913, p. 273—278, tab. XIII).

Němec, B. Zur Kenntnis der niederen Pilze. V. Über die Gattung Anisomyxa Plantaginis n. g. n. sp. (Bull. int. Ac. Sc. Bohême 1913, 15 pp., 2 tab., 7 fig.).

Němec, B. Zur Kenntnis der niederen Pilze. VI. Eine neue Saprolegniacee (Bull. int. Ac. Sc. Bohême 1913, 12 pp., 12 fig.).

Pantanelli, E. Ancora sull'inquinamento dell terreno con sostanze nocive prodotte da funghi parassiti delle piante (Atti r. Accad. Lincei Roma vol. XXII, 1913, p. 170—174, 1 fig.).

Patouillard, N. Quelques champignons du Tonkin (Bull. Soc. Myc. France vol. XXIX, 1913, p. 206—228).

Pietsch, W. Trichoseptoria fructigena Maubl. Eine für Deutschland neue Krankheit der Quitten und Äpfel. (V. M.) (Ber. Deutsch. bot. Ges. vol. XXXI, 1913, p. 12—14).

Ravaz, L. et Verge, G. La germination des spores d'hiver de Plasmopara viticola (Compt. Rend. Acad. Sc. Paris vol. CLVI, 1913, p. 800—802).

Ravn, F. Kölpin. Forsög med midler mod Rugens Staengelbrand (Experiments on remedies against the attack of Urocystis occulta (Wallr.) (Tidsskr. Landbr. Planteavl. vol. XIX, 1912, p. 214—228).

Reuter, C. Ueber die Chemie der Pilze und ihren Nährwert (Die Naturwiss. vol. I, 1913, p. 156—159).

Ritter, C. E. Die giftige und formative Wirkung der Säuren auf die Mucoraceen und ihre Beziehung zur Mucorhefebildung (Jahrb. wissensch. Bot. vol. LII, 1913, p. 351—403, 1 tab.).

Rorer, J. B. The use of the green muscardine in the control of some sugar cane pests (Phytopathology vol. III, 1913, p. 88—92, tab. VII).

Rubner, M. Ueber die Nahrungsaufnahme bei der Hefezelle (Sitzungsber. Akad. Wiss. Berlin 1913, 10 pp.).

Sartory, A. Les empoisonnements par les champignons en été 1912. (Paris 1912, 8°, 53 pp., 6 tab. col.).

Sartory, A. et Bainier, G. Etudes morphologique et biologique d'un champignon nouveau du genre Gymnoascus, Gymnoascus confluens n. sp. (Bull. Soc. Myc. France vol. XXIX, 1913, p. 261—272, tab. XII).

Sauton. Sur la sporulation de l'Aspergillus fumigatus. (Compt. Rend. Soc. Biol. Paris vol. LXXIV, 1913, p. 38—39).

Schaffnit, E. Beiträge zur Biologie der Getreide-Fusarien (Jahresber. Ver. angew. Botanik vol. IX, 1913, p. 39—51).

Schaffnit, E. Zur Systematik von Fusarium nivale bzw. seiner höheren Fruchtform (Mycolog. Centralblatt vol. II, 1913, p. 253—258, 2 fig.).

Schmidt, A. Beitrag zur Kenntnis der deutsch-ostafrikanischen Mistpilze (Jahresber. Schles. Ges. f. vaterl. Cultur II. Abt. Zool.-bot. Sektion 1912, p. 17—25).

Schroevers, T. A. C. Eene voor Nederland nieuwe seringen ziekte, veroorzaakt door Phytophthora Syringae Klebahn (Tijdschr. over Plantenziekten vol. XIX, 1913, p. 41—64, 2 tab.).

Shear, C. L. Some observations on phytopathological problems in Europe and America (Phytopathology vol. III, 1913, p. 77—87).

Speare, A. T. Fungi parasitic upon insects injurious to sugar cane (Rep. Exp. Stat. Hawaiian Sugar Planters' Assoc. Bull. no. 12, 1912, p. 5—62, 6 tab., 2 fig.).

Speare, A. T. and Colley, R. H. The artificial use of the brown-tail fungus in Massachusetts, with practical suggestions for private experiment, and a brief note on a fungous disease of the gypsy caterpillar (Boston 1912, 26 pp., 8 tab., 2 fig.).

Staritz, R. Pilze aus Anhalt (Hedwigia vol. LIII, 1913, p. 161—163).

Sturgis, W. C. The Myxomycetes of Colorado. II. (Colorado College Public. Gen. Series no. 68. Science Ser. vol. XII, 1913, no. 12, p. 435—454, tab. 2).

Tobler, Fr. Verrucaster lichenicola nov. gen., nov. spec. (Abhandl. Naturw. Ver. Bremen vol. XXI, 1912, p. 383—384, 5 fig.).

Trinchieri, G. Per la difesa delle culture in Libia (Rivista d'Italia 1913, 12 pp.).

Truffaut, T. Les ennemis des plantes cultivées (Maladies-insectes). Traité complet de pathologie et de thérapeutique végétales. (Paris 1912, 8°, 565 pp., 53 tab.)

Vouk, V. Untersuchung über die Bewegung der Plasmodien. Teil II. Studien über die Protoplasmaströmung (Denkschr. Akad. Wiss. Wien 1912, 40 pp., 2 tab., 12 fig.).

Weir, J. R. Some observations on Polyporus Berkeleyi (Phytopathology vol. III, 1913, p. 101—104, tab. IX).

Wight, C. J. A stem rot disease of carnations due to a species of Fusarium (Pomona Coll. Journ. econ. Bot. vol. II, 1913, p. 315—336, 5 tab.).

Wilcox, E. M. Smuts of Nebraska cereals (Bull. Agr. Exp. Stat. Univ. Nebraska, no. 131, 1913, 16 pp., 13 fig.).

Wilcox, E. M., Link, G. K. K. and Pool, V. W. A dry rot of the Irish potato tuber (Research Bull. Exp. Stat. Univ. Nebraska no. 1, 1913, 88 pp., 28 tab.).

Wollenweber, H. W. Pilzparasitäre Welkekrankheiten der Kulturpflanzen (Ber. deutsch. bot. Ges. vol. XXXI, 1913, p. 17—34).

Bachmann, E. Der Thallus der Kalkflechten (V. M.) (Ber. Deutsch. bot. Ges. vol. XXXI, 1913, p. 3—12, 1 tab.).

Bouly de Lesdain. Quelques Lichens de la forêt de Fontainebleau (Bull. Soc. bot. France vol. LVIII, 1911, p. 549—555).

Bouly de Lesdain. Notes lichénologiques (Bull. Soc. bot. France vol. LIX, 1913, p. 686—689).

Chodat, R. Lichens épiphylles sur les buis de la forêt de Coudrée (Lac Léman) (Bull. Soc. Bot. Genève 2. sér. IV, 1912, p. 246).

Fink, Bruce. The nature and classification of Lichens — II. The lichen and its algal host (Mycologia vol. V, 1913, p. 97—166).

Harmand, abbé. Lichens recueillis dans la Nouvelle-Calédonie ou en Australie par le R. P. Pionnier, Missionnaire (Bull. Soc. Sc. Nancy 3 sér. XIII, 1912, p. 21—48).

Herre, A. W. C. T. The Lichens of Mt. Rose, Nevada (Botan. Gazette vol. LV, 1913, p. 392—396).

Linkola, K. Über die Thallusschuppen bei Peltigera lepidophora (Nyl.) (Ber. Deutsch. bot. Ges. vol. XXXI, 1913, p. 52—54, 1 tab.).

Pitard et Harmand. Contribution à l'étude des Lichens des îles Canaries (Bull. Soc. bot. France vol. LVIII, 1911, 72 pp.).

Scriba, L. Cladonien aus Korea (Hedwigia vol. LIII, 1913, p. 173—178).

Referate und kritische Besprechungen[1]).

Bainier, G. et **Sartory, A.** Etudes morphologique et biologique du Muratella elegans n. sp. (Bull. Soc. Mycol. France vol. XXIX, 1913, p. 129—136, tab. I—III).

Muratella elegans, ein auf totem Holz wachsender Pilz aus der Familie der Mucoraceen, und verwandt mit *Mortierella*, hat bisher nur eine Sporenform — Konidien — gebildet. Er wächst auf allen Medien, spaltet Glukose und schwach auch Maltose, läßt Saccharose, Laktose und Galaktose unverändert, verflüssigt Gelatine, nicht aber Stärke. Neger (Tharandt).

Bainier, G. et **Sartory, A.** Nouvelles recherches sur les Citromyces. — Etude de six Citromyces nouveaux (Bull. Soc. Mycol. vol. XXIX, 1913, p. 137—161 tab. IV—V).

Trotz der Schwierigkeit, *Citromyces*-Arten voneinander zu unterscheiden, glauben die Verff. doch 5 neue Arten dieser Gattung aufstellen zu können (nicht wie es im Titel heißt, sechs): *C. minutus*, *C. ramosus*, *C. Cesiae*, *C. Musae*, *C. cyaneus*. Die Unterschiede begründen sich hauptsächlich auf Wachstumserscheinungen auf verschiedenen Nährböden (Gewicht nach 30 Tagen), Pigmentbildungen und dergl.; so bleiben die Kulturen der beiden erstgenannten fast farblos, während die drei übrigen einen roten Farbstoff entwickeln. Neger (Tharandt).

Höhnel, Fr. von. Fragmente zur Mykologie (XIV. Mitteilung, No. 719 bis 792) (Sitzungsber. Kais. Akad. Wiss. Wien mathem.-naturw. Kl. vol. CXXI, Abt. I, 1912, p. 339—424, tab. I—II, 7 fig.).

In bekannter Weise behandelt Verf. in dieser Fortsetzung von

Uredineen die beiden neuen Arten *Klastopsora Curcumae* und *Uredo Lanneae*. Erstere ist jedoch sicher falsch klassifiziert und letztere muß gestrichen werden, da diese Uredoform schon bekannt ist.

Basidiomyceten die kürzlich von Bresadola aufgestellte Gattung *Jaapia*, die als eine sterile, durch reichliche Chlamydosporenbildung erschöpfte *Coniophora arida* gedeutet wird, ferner *Wiesnerina secunda* n. sp., *Polyporus Hoehnelii* Bres. n. sp., *Panus cochlearis* (Pers.) Oud.

Ascomyceten insbesondere die Gattung *Micropeltis*, viele *Nectria*-Arten, *Euryachora Pithecolobii* Rac., für welche die neue Gattung *Montag-*

[1]) Die nicht unterzeichneten Referate sind vom Herausgeber selbst abgefaßt.

nellina geschaffen wird, ferner *Teratosphaeria fibrillosa*, einige *Phyllachora*-Arten, *Moutoniella polita* Penz. et Sacc., *Discomycella* nov. gen. (eine Übergangsform von den gehäuselosen zu den vollkommen entwickelten Discomyceten bildend), *Asterocalyx* nov. gen., die als winzige Bulgariacee gedeutet wird, von

Fungi imperfecti namentlich die neue mit *Wojnowicia* verwandte Gattung *Angiopomopsis*, sowie *Linochorella* (= *Septoriella*), *Triposporina* nov. gen. mit merkwürdigen Konidien, *Exosporella* nov. gen. (zu den Tuberculariaceen gehörig) und einige andere Formen.

Wegen der zahlreichen Einzelheiten müssen wir auf das Original verweisen.

Magnus, P. Die Verbreitung der Puccinia Geranii Lév. in geographisch-biologischen Rassen (Ber. d. Deutsch. Bot. Ges. Vol. XXXI, 1913, p. 83—87, 1 tab.).

Die in den hohen Lagen der Alpen und im Norden von Europa auftretende *Puccinia Geranii-silvatici* Karst. ist identisch mit der von C. Gay in Chile auf *Geranium rotundifolium* aufgefundenen *Puccinia Geranii* Lév., daher gebührt letzterem Namen die Priorität. In Europa kommt dieser Pilz auf *Geranium rotundifolium* nicht vor, sondern nur auf *Geranium silvaticum*; in anderen, weit auseinander liegenden Gebieten ist er auf anderen *Geranium*-Arten gefunden worden, ohne merklich morphologische Verschiedenheiten aufzuweisen. Hieraus zieht der Verfasser den Schluß, daß bei dieser *Puccinia* die in den verschiedenen Verbreitungsgebieten lebenden Formen als geographisch-biologische Rassen zu unterscheiden seien. Dietel (Zwickau).

Schmidt, A. Beitrag zur Kenntnis der deutsch-ostafrikanischen Mistpilze (Jahresber. Schles. Ges. f. vaterl. Cultur. II. Abt. Zool. bot. Sektion 1912, p. 17—25).

Verf. nennt 45 koprophile Pilze für Ostusambara, größtenteils Phycomyceten und Ascomyceten. Die meisten Arten kommen auch in Europa vor. Als neu beschrieben werden *Lasiobolus setosus*, *Sordaria Kilimandscharica*, *Philocopra millespora*. Ein Teil der aufgeführten Arten wurde in Breslau auf dem aus Afrika mitgebrachten Miste kultiviert, während der Rest direkt in Usambara beobachtet wurde.

Sturgis, W. C. The Myxomycetes of Colorado. II. (Colorado College Public. Gen. Ser. no. 68. Science Ser. vol. XII, 1913, no. 12, p. 435—454, tab. 2).

In dem 1907 erschienenen ersten Bericht über die Myxomyceten Colorados waren 94 Arten aufgeführt worden. Diese Fortsetzung umfaßt 39 Spezies, von welchen 33 neu für Colorado sind. Einige Arten, nämlich *Fuligo megaspora*, *Didymium anomalum*, *Enerthenema syncarpon*, sind überhaupt neu. Fast allen Arten sind wertvolle kritische oder diagnostische Bemerkungen beigegeben.

Tobler-Wolff, Gertrud. Die Synchytrien. Studien zu einer Monographie der Gattung (Archiv für Protistenkunde vol. XXVIII, 1913, p. 141—238, tab. 10—13).

Die Arbeit gibt uns eine vorzügliche Übersicht über alles, was wir zurzeit über die Gattung *Synchytrium* wissen. Trotzdem schon mehrfach einzelne Arten der Gattung genauer untersucht worden sind, so muß doch zugestanden werden, daß unsere Kenntnisse über die eigenartige Gattung noch sehr unvollkommen sind. Daher ist jede Arbeit zu begrüßen, die hier Wandel zu schaffen sucht.

Verf. gibt zunächst einen historischen Überblick über die Geschichte der Gattung und bespricht in einzelnen Kapiteln unter Einfügung eigener Untersuchungen die Morphologie und Entwicklungsgeschichte, die zytologischen und biologischen Verhältnisse, den Einfluß der Arten auf die Wirtspflanzen, die geographische Verbreitung der Arten.

Im speziellen, weitaus größeren Teile wird auf die Systematik eingegangen. Hier bringt Verf. eine neue Anordnung der Arten nach folgendem Schema:

I. Bildung mehrerer Zoosporengenerationen in einem Sommer; zuletzt Bildung eines Dauersorus. Inhalt rotgelb . . . . . Pleiochytrium.
  A. Bildung der Dauersporen innerhalb der Initialzelle . . . . . *Eusynchytrium.*
  B. Bildung der Sporangiensori außerhalb der Initialzelle, aber noch auf der lebenden Pflanze . . . . . *Mesochytrium.*

II. Direkte Bildung einer „Dauerspore“ (Dauersorus), Sporangienbildung erst nach Verwesung der Wirtspflanze . . . . . Haplochytrium.
  A. Inhalt gelb . . . . . *Chrysochytrium.*
  B. Inhalt farblos . . . . . *Leucochytrium.*

Die Umgrenzung der Arten bietet große Schwierigkeiten. Hier müssen zur Unterscheidung unbedingt biologische Merkmale herangezogen werden, auch die Zytologie wird fördernd eingreifen können. Verf. führt 26 besser bekannte Arten auf, zu denen noch 25 weitere sichere Spezies kommen, zusammen also 51 Arten, die genau besprochen werden. Einige Arten, nämlich *S. trichophilum* in den Haaren von *Symphytum officinale* bei Leipzig, *S. aurantiacum* auf *Salix repens* in Westpfalen, *S. Ulmariae* auf *Filipendula Ulmaria* in Schweden, werden als neu beschrieben. Schließlich werden noch 12 zweifelhafte und 8 aus der Gattung auszuschließende Formen aufgeführt. Die Gattung *Chrysophlyctis* wird nach Percival's Vorgang mit *Synchytrium* vereinigt, während W. Bally bekanntlich für ihre Selbständigkeit eintritt.

Arnaud, G. et **Foex E.** Sur l'Oidium des chênes (Microsphaera quercina) (Compt. Rend. Acad. Sc. Paris vol. CLIV, 1912, p. 1302).

Die vom Verf. gefundenen Perithezien gestatteten, den Eichenmeltau als *Microsphaera quercina* zu bestimmen. Den Autoren, welche früher bereits Perithezien auf europäischen Eichen gefunden hatten (Passerini, Mayor), hat nach Ansicht des Verf. dieselbe Spezies vorgelegen. *Microsphaera quercina*, *M. densissima*, *M. extensa*, *M. Alni* usw. sind Synonyma.

Küster (Bonn).

Griffon, Ed. et **Maublanc, A.** Les Microsphaera des chênes et les périthèces du blanc du chêne (Compt. Rend. Acad. Sc. Paris vol. CLIV, 1912, p. 935).

Die in Amerika gefundenen Eichenmeltauarten gehören nach den Verff. den Arten *Microsphaera abbreviata* Peck und *M. extensa* Cooke et Peck an; die seltenen Perithezienproben, die auf europäischen Eichen gefunden worden sind, stehen teils *M. Alni* nahe, teils (Passerini) repraesentieren sie eine weitere bisher unbekannte Art; die Verff. schlagen vor, die *Microsphaera* des europäischen Eichenmeltaus zu bezeichen als *M. alphitoides* Griff. et Maubl. Küster (Bonn).

Griffon, Ed. et **Maublanc, A.** Sur quelques champignons parasites des plantes tropicales (Bull. Soc. Mycol. France vol. XXIX, 1913, p. 244—250, tab. IX).

Behandelt parasitäre Erkrankungen von *Hevea brasiliensis* (durch *Dothidella Ulei* P. Henn, Blattflecken verursachend) und von *Butyrospermum Parkii* (erzeugt durch *Fusicladium Butyrospermi* Griff et Maubl., auf den Blättern). Neger (Tharandt).

Rosenbaum J. Infection experiments with Thielavia basicola on Ginseng. (Phytopathol. vol. II, 1912, p. 191—196, tab. XVIII—XIX).

Thielavia basicola wurde vom Verf. an Tabak, Ginseng und Baumwolle isoliert und in Kultur genommen. Morphologisch und physiologisch zeigten die drei Stämme des Pilzes keine Unterschiede; da auch wechselseitige Infektionsversuche gelangen, kommt Verf. zu dem Schluß, daß die drei untersuchten Thielavien identisch sind. Riehm (Berlin-Dahlem).

Schaffnit, E. Zur Systematik von Fusarium nivale bzw. seiner höheren Fruchtform (Mycol. Centralbl. vol. II, 1913, p. 253—258).

Verf. sucht im vorliegenden Aufsatz einen Irrtum richtig zu stellen, der ihm bei seiner Arbeit über den Schneeschimmel untergelaufen ist; er hatte nämlich Perithezien, die in Reinkulturen von *Fusarium nivale* entstanden waren, als *Nectria graminicola* bestimmt. Jetzt glaubt er, eine *Calonectria* vor sich gehabt zu haben und beschreibt die Perithezien als lachs- bis ziegelrote, gealtert braunrote Gebilde; in seiner ersten Publikation gab er an, die Perithezien seien schwarz! „Alle diese dunkelgefärbten als Schlauchfrüchte angesprochenen Formen erwiesen sich als massiv.“ „Die kugeligen Gebilde, deren Größe 150—300 μ beträgt, sind keine Perithezien, deren innere Differenzierung noch aussteht oder aus Mangel an den erforderlichen Ernährungsbedingungen überhaupt noch nicht

erfolgt ist, sondern es handelt sich hier um eine andere noch nicht wesentlich beachtete Erscheinungsform, um sklerotienartige Organe.“ Immerhin erscheint es eigenartig, daß Sklerotien für Perithezien gehalten werden konnten; da die Farbe der Perithezien — und solche wurden doch tatsächlich gefunden, da auch Asci beschrieben werden! — als schwarz oder dunkel angegeben wurde, ist es auch möglich, daß Schaffnit weder eine *Nectria* noch überhaupt eine Hypocreacee vor sich gehabt hat.

Weese, J. Über den Zusammenhang von Fusarium nivale, den Erreger der Schneeschimmelkrankheit der Getreidearten und Wiesengräser, mit Nectria graminicola Berk. et Br. (Zeitschrift für Gärungsphys. vol. II, 1912, p. 290).

Auf Grund vergleichender Untersuchungen des Originalmaterials von *Nectria graminicola* Berk. et Br. aus dem botanischen Museum in Kew mit Originalmaterial des von Ihssen untersuchten Pilzes kommt Verf. zu der Überzeugung, daß Ihssen's Pilz keine *Nectria* ist, weil er im Substrat eingesenkte Perithezien besitzt. Mir scheint auch aus einem anderen Grunde der von Ihssen untersuchte Pilz keine *Nectria* zu sein; die Perithezien sind braunschwarz und *Nectria* hat meist keine schwarzen Perithezien. Verf. glaubt, daß Ihssen eine *Leptosphaeria* oder *Metasphaeria* vor sich gehabt hat; daß dieser Pilz wirklich mit *Fusarium nivale* zusammenhängt, wird bezweifelt, da „bisher nur Hypocreaceen als Askusform von Fusarien festgestellt werden konnten“. Offenbar kennt Verf. die Arbeit von Voges nicht, der in Reinkultur aus Ascosporen von *Ophiobolus* Fusariumkonidien erhielt. Riehm (Berlin-Dahlem).

Wollenweber, H. W. Studies on the Fusarium problem. (Phytopathol. vol. III, 1913, p. 24—50, tab. V).

Da sich bei Kulturen von *Gibberella*, *Melanospora*, *Hypocrea*, *Mycosphaerella* und *Calonectria* gezeigt hatte, daß die Bildung eines Stroma auf verschiedenen Nährböden variiert, glaubt Verf. schließen zu dürfen, daß sich das Stroma als unterscheidendes Merkmal für die Einteilung der Ascomyceten nicht eigne. Wäre dieser Schluß berechtigt, so würde es wohl sehr schwer halten, überhaupt noch Merkmale zu finden, nach denen eine Einteilung größerer Pilzgruppen in Familien möglich wäre; denn welche Merkmale lassen sich nicht durch äußere Bedingungen variieren? Ich erinnere nur an die Untersuchungen von Stevens und Hall, die bei einigen Fungi imperfecti je nach den Kulturbedingungen Konidienbildung in Pykniden, in Konidienlagern oder an einzelnen Trägern erhielten. Als eins der wichtigsten Unterscheidungsmerkmale für Fusarien betrachtet Verf. die Septierung der Konidien, die auch außerordentlich variabel ist; um so auffallender ist es, daß er die Stromabildung nicht als Unterscheidungsmerkmal anerkennen will, weil sie mit den Kulturbedingungen variiert. Die Gattung *Nectria* läßt sich von *Hypomyces* scharf trennen, wenn man alle Pilze dieses Formenkreises mit Chlamydosporen zu *Hypomyces*, alle ohne Chlamydosporen zu *Nectria* stellt.

In einem besonderen Abschnitt sind einige Fusarien zusammengestellt und kurze Bemerkungen über ihre Pathogenität gemacht; *Fusarium coeruleum*, *F. discolor* var. *sulphureum*, *F. trichothecioides*, *F. ventricosum* usw. rufen Knollenfäule der Kartoffel hervor, *Fusarium oxysporum* und *Verticillium alboatrum* sind, wie bereits bekannt, Erreger von Welkekrankheiten.

Als neu werden in diesem Kapitel aufgestellt *Fusarium vasinfectum* var. *inodoratum*, *F. redolens*, *F. conglutinans*, *F. sclerotium*. Zu *Ramularia*(!) wird *Fusarium didymum*, das eine Wurzelfäule verursacht, gestellt.

Riehm (Berlin-Dahlem).

Blakeslee, A. F. Conjugation in the heterogamic genus Zygorhynchus (Mycol. Centralblatt vol. II, 1913, p. 241—244, tab. I—II).

Verf. wendet sich gegen die Ausführungen Gruber's; dieser glaubt, bei *Zygorrhynchus* den Übertritt von Protoplasma aus dem einen Gameten in den anderen beobachtet zu haben, und zwar aus dem nach Blakeslee weiblichen in den männlichen. Gruber kommt daher zu dem Ergebnis, daß Blakeslee's männlicher Gamet tatsächlich der weibliche ist. In der vorliegenden Arbeit wiederholt Blakeslee nochmals seine Ansicht und sucht dieselbe durch eine Reihe von Figuren zu stützen.

Riehm (Berlin-Dahlem).

Burgeff, H. Über Sexualität, Variabilität und Vererbung bei Phycomyces nitens (Ber. Deutsch. Bot. Ges. vol. XXX, 1912, p. 679—685).

Nach Blakeslee bildet *Phycomyces nitens* bekanntlich teils sexuell aktive, teils neutrale Myzelien. Es darf angenommen werden, daß die letzteren eine Mischung von + und —Energiden enthalten. Dem Verf. ist es gelungen, den bestimmten Beweis für die Richtigkeit jener Annahme zu liefern, indem er durch mechanische Übertragung von kernhaltigen Plasmateilen des + Myzels in Plasma des — Myzels ein neutrales Myzel gewissermaßen synthetisch herzustellen vermochte. Weiterhin beschreibt der Verf. die Entstehung einer Variante *„piloboloides“* aus einer + *„Phycomyces nitens“*-Kultur, sowie daß es ihm gelang, durch Selektion aus dieser heterocaryotischen Form die homocaryotische *„Piloboloides“*-Form rein zu erhalten, endlich die Kreuzung der fast reinen + *Piloboloides*-Form mit einer — *„Nitens“*, wobei die —Form von *Piloboloides* auftrat, was beweist, daß in der Zygote ein Austausch der Charaktere stattgefunden hat. Die Mitteilung ist vorläufig. Die interessanten bisherigen Ergebnisse lassen sehr bemerkenswerte Aufschlüsse über Vererbung und Variabilität der heterothallischen und homothallischen Mucorineen erwarten.

Neger (Tharandt).

Winge, Ö. Cytological studies in the Plasmodiophoraceae (Arkiv för Botanik vol. XII, 1912, no. 9, 39 pp., 3 tab.).

Eine Beschreibung der wichtigsten Plasmodiophoraceen vom Standpunkt der Zytologie und Pathologie, wobei allerdings vielfach die Angaben anderer Autoren Verwendung finden. Spezieller wird beschrieben

die Teratologie der von *Sorosphaera Veronicae* befallenen *Veronica*-Arten — z. T. nach handschriftlichen Aufzeichnungen v. Lagerheims — sowie die neue Gattung *Sorodiscus* Lagerh. et Winge. Im einzelnen gliedert sich die Arbeit in folgende Abschnitte:

Kritische Bemerkung zu Nawaschins Darstellung der Zytologie von *Pl. Brassicae*, welche als vorbildlich und typisch für diese Pilzfamilie gelten kann.

Sorosphaera Veronicae Schroet. (Verbreitung des Pilzes nach Ländern und Wirtpflanzen, pathologische Wirkung des Pilzes — Hypertrophien an oberirdischen und unterirdischen Organen —, Zytologie des Pilzes —). Die Ergebnisse des Verf. stimmen mit jenen von früheren Forschern, z. B. Maire und Tison überein, mit Ausnahme von zwei Punkten: Das Idiochromatin hat nach dem Verf. nicht die Form eines Ringes, sondern einer Platte, und ein vollkommenes Verschwinden des Nucleolus bei Beginn der Sporogonphasis konnte nicht beobachtet werden).

Ligniera Junci und *L. graminis.*

Sorodiscus Callitrichis Lagerh. und Winge, als Vertreter der neuen Gattung *Sorodiscus*, welche der Gattung *Sorosphaera* nahesteht (hinsichtlich der Sporen), sich aber dadurch auszeichnet, daß die Sporenhäufchen aus zwei Schichten zusammengesetzte Plazenten von kreisförmigem Umfang bilden. Der Pilz verursacht an den Stengeln von *Callitriche vernalis* kugelige Anschwellungen. Über die nun folgenden Arten: *Spongospora subterranea*, *Tetramyxa parasitica*, *Chrysophlyctis endobiotica*, *Asterocystis radicis*, *Rhizomyxa hypogaea*, *Woronina polycystis*, *Pyrrhosorus marinus*, *Sorolpidium Betae* teilt der Verf. nichts wesentlich Neues mit.

Den Schluß bilden vergleichende Betrachtungen über den Entwicklungskreislauf einerseits bei den eigentlichen Plasmodiophoraceen, andererseits bei *Pyrrhosorus* und *Sorolpidium*. Danach würde der Aggregation von Sporen — bei Plasmodiophoraceen — eine an anderer Stelle des Kreislaufs erfolgende Aggregation von Sporenmutterzellen (bei den letztgenannten Gattungen) entsprechen. Neger (Tharandt).